DOCTOR OF PHILOSOPHY

# Assessment of diabetes care in Saudi Arabia

## by analysis of routine healthcare data, patient case notes and interviews with key stakeholders

Alshehri, Abdullah

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By

Abdullah Alshehri, MD, MPH

*This thesis is submitted for the degree of Doctor of Philosophy in Public Health*

**Division of Biomedical Science and Public Health**

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*In the Name of Allah, the Most Merciful, the Most Compassionate*

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By

Abdullah Alshehri, MD, MPH

2010-2014

**Supervised by:**

**Main supervisor:**

*Professor Iain K Crombie*, BSc, PhD, MSc, C Stat, FFPHM, Professor of Public Health, Head of Division of Biomedical Sciences and Public Health, School of Medicine, University of Dundee, Dundee, Scotland, UK.

**Co-supervisor:**

*Doctor Malinda A J Irvine*, BSc Nursing, PhD, Lecturer in Public Health, Division of Population Health Sciences, School of Medicine, University of Dundee, Dundee, Scotland, UK.

**March 2014**

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# Dedication

**This thesis is dedicated to:**

ALLAH, the Almighty God;

My beloved mother, Fatima, who dedicated her life to taking care of me. Thank you for your endless love, support and encouragement;

My dearest, brilliant wife, Dena, who joined me on our journey through the valley of darkness with the light of eternal love, hope and support;

My sons, Nasser, Ziad, and Faeez, whose mere existence has motivated me to work towards a world with a future; there were many times when this thesis took me away from spending precious moments with them. They teach me about unconditional love.

# Declaration

I hereby declare that I am the sole author of this thesis and that the author has consulted all references cited within this work. I further declare that this thesis, neither in whole nor in part, has been previously accepted for a higher degree award.

Signature: ……

Name: ……

Date: ……

As supervisor of this thesis, I hereby certify that the conditions of the relevant Ordinance and Regulations have been fulfilled.

Signature: ……

Name: ……

Date: ……

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*Abdullah*

*03/2014*

# List of abbreviations

ACEIs: Angiotensin Converting Enzyme Inhibitors

ACH: Aseer Central Hospital

ADA: American Diabetes Association

ADC: Aseer Diabetes Centre

AGH: Abha General Hospital

ARAMCO: The Saudi Arabian Oil Company

ARBs: Angiotensin Receptor Blockers

BMI: Body Mass Index

BP: Blood pressure

$\chi^2$: chi square

CBC: Complete Blood Count

CIs: Confidence Intervals

df: Degree of freedom

DM: Diabetes Mellitus

ECG: Electrocardiogram

ESR: Erythrocyte Sedimentation Rate

ESRD: End-Stage Renal Disease

FBG: Fasting Blood Glucose

FPG: Fasting Plasma Glucose

GCC: The Cooperation Council for the Arab States of the Gulf

GDM: Gestational Diabetes Mellitus

GHO: Global Health Observatory

HbA1c: Glycated haemoglobin

IDF: International Diabetes Federation

IFG: Impaired Fasting Glucose

IGT: Impaired Glucose Tolerance

Kg: kilogram

LDL cholesterol: Low-density lipoprotein cholesterol

LFT: Liver Function Tests

m: Metre

MeSH: Medical Subject Headings

mg/dl: Milligrams per decilitre

mmHg: Millimetre of mercury

mmol/l: Millimole per litre

MODY: Maturity Onset Diabetes of Youth

MOH: Ministry of Health in Saudi Arabia

OGTT: Oral Glucose Tolerance Test

OR: Odds Ratio

PAD: Peripheral Arterial Disease

QALY: Quality-Adjusted Life-Year

PHCCs: Primary Health Care Centres

RBG: Random Blood Glucose

RCTs: Randomized Controlled Trials

RFT: Renal Function Tests

RHA: Regional Health Affairs

RPG: Random Plasma Glucose

SA: Saudi Arabia

SIGN: Scottish Intercollegiate Guidelines Network

T1DM: Type 1 Diabetes Mellitus

T2DM: Type 2 Diabetes Mellitus

UK: United Kingdom

US$: United State Dollar

USA: United state of America

WHO: World Health Organization

**Contributors:**

**AA**: Abdullah Alshehri (Author of this thesis)

**IC**: Professor. Iain Crombie (Main supervisor)

**LI**: Dr. Malinda Irvine (Co-supervisor)

**LO**: Lucita Gallo Quintana (Head nurse)

**MA**: Dr. Mohammad Awaad (Consultant diabetologist)

**YA**: Dr. Yahia Alkhaldi (Family medicine consultant)

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# Abstract

**Background:**

Diabetes is a major public health problem in Saudi Arabia. One fifth (20%) of the Saudi population has diabetes and their healthcare takes almost a quarter (23%) of the total healthcare expenditure. A few sporadic small studies showed some evidence of suboptimal diabetes care.

**Aims:**

The aim of this study was to identify the deficiencies in diabetes care and the potential areas for quality improvement of service provision in Abha, a city representative of Saudi Arabia.

**Methods:**

A programme of research was undertaken using multiple research methods: semi-structured interviews with key stakeholders encompassing patients, healthcare professionals, managers and pharmacists; standard checklist for evaluating available resources; analysis of routine healthcare data; questionnaires to medical directors and healthcare leaders; and examination of the case notes of patients with diabetes.

**Results:**

The local registered diabetes prevalence was found to be lower than the national estimate (3.75% versus 14-25%). Almost three quarters (73%) of people with diabetes

in Abha city have not been diagnosed. The vast majority (85%) of adult people with diabetes were either overweight or obese.

Reviewing case notes of patients with diabetes at the primary health care centres (PHCCs) showed that only 4% had a record of HbA1c test and most patients (77%) did not achieve the recommended target of FBG of ≤ 130 mg/dl (≤7.2 mmol/l). Almost half the patients exceeded (47%) the recommended level of total cholesterol of ≤ 195 mg/dl (5 mmol/l). Screening for diabetes complications is inadequate: foot examination was done for only 5.5%, neuro-examination for 37% and eye examination for 52%. Some medications e.g. mixed insulin and statins were not consistently available and inadequacies were identified in the provision of healthcare staff (e.g. dieticians and podiatrists) and laboratory resources (e.g. HbA1c test). Limited attention was given to health education and concerns were expressed about patient compliance. These findings were consistent across the multiple methods used.

**Conclusion:**

This study in Abha city found that a large number of Saudi patients with diabetes are not achieving recommended levels of glycemic, lipid and body mass index (BMI) control and are therefore at high risk of diabetes complications. Inadequate provision of laboratory facilities, drugs and patient education programmes compound these problems. Recommendations are made for strategies to improve both the structure and processes of diabetes care and the healthy behaviours of people with diabetes.

# CHAPTER ONE

# Background to diabetes in Saudi Arabia

*This chapter provides a background to the size of the problem of diabetes as an epidemic disease in Saudi Arabia. It gives a review of research activities in Saudi Arabia on diabetes epidemiology, its clinical and complications profile. It begins with a general introduction to diabetes as a disease. It then briefly describes the country of Saudi Arabia and the major social and economic changes that affect the general health status of the Saudi population. Several demographic and public health indicators are presented. The chapter then reports in depth the time trend of diabetes development among Saudis, the current high prevalence of diabetes, its risk factors and complications. It also shows the huge burden and costs this disease imposes on the Saudi healthcare system.*

# Chapter 1: Background to diabetes in Saudi Arabia

## 1.1. Introduction to diabetes

Diabetes mellitus (DM) is currently recognized as a long term condition that comprises a heterogeneous group of disorders characterized by sustained hyperglycaemia and glucose intolerance with disturbances of carbohydrate, fat and protein metabolism. It is caused by insulin deficiency, impaired effectiveness of insulin action or both. [1-3] The direct toxic effect of the sustained hyperglycaemia is significantly associated with long term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.[3-6] The clinical manifestations of the long term effect of diabetes, therefore, include retinopathy that may lead to blindness, nephropathy that may end with renal failure, and neuropathy that increases the risk of foot ulcers, amputation and sexual dysfunction. Diabetes also increases the risk of cardio-vascular, cerebro-vascular and peripheral vascular diseases.

Diabetes is classified based on its etiological and clinical stages into four main types: type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), gestational diabetes mellitus (GDM) and other specific types. T1DM usually occurs in childhood or early adult life. People with T1DM require insulin for survival in order to prevent the development of ketoacidosis, coma and death. T2DM is the commonest form of diabetes and usually occurs in obese middle-aged or elderly people. In contrast to

T1DM, T2DM is not dependent on exogenous insulin but may require insulin for metabolic control rather than for survival. GDM is carbohydrate intolerance first recognized in pregnancy. The other specific types of diabetes are less common and caused by or associated with several genetic, drug-induced or infectious diseases.

Using the latest American Diabetes Association (ADA) and World Health Organization (WHO) diagnostic criteria, DM is diagnosed:

1. If a person with clinical symptoms of diabetes such as abnormal thirst, frequent urination, constant hunger, lack of energy, weight loss or blurred vision has a random plasma glucose(RPG) ≥ 11.1 mmol/l (200mg/dl) or
2. By Fasting plasma glucose (FPG) ≥ 7.0 mmol/l (126mg/dl) or
3. By a plasma glucose ≥ 11.1 mmol/l (200mg/dl), 2 hours after 75 gram load of glucose given by mouth [the oral glucose tolerance test (OGTT)] or
4. By glycated haemoglobin (HbA1c) ≥ 6.5%.

The diagnosis of diabetes should be confirmed by repeat testing on a subsequent day if one of the criteria 2-4 was used and the level of hyperglycaemia was not unequivocal. (3, 7-8)

The disease natural history usually passes through a stage of impaired glucose tolerance (IGT) which is defined as a plasma glucose ≥ 7.8 mmol/l (140 mg/dl) and < 11.1 mmol/l (200 mg/dl) two hours after an OGTT. An analogous stage, impaired fasting glucose (IFG), is defined as FPG levels of ≥ 5.6 mmol/l (100mg/dl) and < 7.0 mmol/l (126 mg/dl). Individuals with IGT or IFG are regarded as having pre-diabetes, indicating the relatively increased risk for the future development of diabetes.[(3)] Losing

weight, increasing physical activity and improving diet can prevent or delay diabetes in individuals with IGT.[9-10] Use of certain pharmacological agents such as metformin has also been shown to decrease the incidence of DM by 31%.[10]

The ultimate goal of diabetes care is to prevent both acute and chronic diabetes complications. This is achieved by providing treatment, support and education to enable people with diabetes to achieve the target glycemic control. Several studies showed definitively that intensive glycemic control is associated with significantly reduced risk of retinopathic, nephropathic and neuropathic complications.[4-6, 11-12] Every percentage point in HbA1c reduction (e.g., from 8% to 7%) reduces the risk of microvascular complications (retinopathy, nephropathy and neuropathy) by 37%.[13] The Scottish Intercollegiate Guidelines Network (SIGN) and ADA recommend that lowering HbA1c to below or around 7% is reasonable to reduce the risk of microvascular and macrovascular complications.[14-15] Moreover, it has been suggested that, at the population level, the greatest number of diabetes complications will be averted by taking patients from very poor control to fair or good control.[14]

It is also important to detect and treat early the complications of diabetes as well as the common coexisting conditions (e.g. hypertension and dyslipidemia). For example, tight control of blood pressure by angiotensin converting enzyme inhibitors (ACEIs) can substantially reduce the risk of death and complications due to diabetes.[16] Detecting and treating early eye disease with laser therapy can reduce the development of severe vision loss by 50-60%.[17] In addition, implementing a comprehensive foot care programme can reduce amputations by 45-85%.[17]

Therefore, properly planned healthcare services and preventive activities can greatly reduce the burden of diabetes on both the patients and the healthcare providers. Proper care of diabetes implies identification of all people with diabetes, early management of their diabetes and early detection of complications which will enable clinicians to take the steps needed to combat the disease. An integrated system that delivers healthcare by collaborative and multidisciplinary teams is best suited to provide care for people with diabetes.[18-21]

## 1.2. Introduction to Saudi Arabia

The Kingdom of Saudi Arabia (KSA) is located at the south west corner of the Asian continent (Map 1). It is the second largest Arab country by land area, constituting over 2,149,690 million square kilometres (870,000 square miles) of the Arab peninsula. It is surrounded to the east by the Arabian Gulf, Qatar, Bahrain, and United Arab Emirates, and the Red Sea to the west, Oman on the southeast and Yemen on the south, Kuwait, Jordan and Iraq on the north. The terrain is mostly desert with mountainous areas along the western part and more than 2,600 kilometres of coastline. [22]

### Map 1: The Kingdom of Saudi Arabia


*Source: Google Maps* [23]

### 1.2.1. *Demographic profile*

The Saudi population comprises 50.9% Saudi males and 49.1% Saudi females. About 10% of the population is from Afro-Asian ethnic groups while 90% is Arabs.[22] The majority of the Saudi population is young. In 2007, a national demographic survey showed that more than 85% of the Saudi population was under the age of 45.[24] However, it has been estimated that this percentage of the young population will decline to 62.5% at 2050 bringing those over the age of 45 years to represent 37.5% of the total population.[25]

### 1.2.2. *Health profile*

The Kingdom of Saudi Arabia has witnessed enormous changes over the last four decades that have touched every aspect of life. Saudi Arabia was founded in 1932 when King Abdulaziz Alsaud succeeded in unifying the different parts of the Kingdom. At that time, the majority of land habitants were nomads or semi-nomad tribes with rudimentary facilities. In 1938, the discovery of vast reserves of oil provided Saudi Arabia with the chance to modernize. Therefore, in the middle of the twentieth century, the traditional, underdeveloped and poor young country started to develop at an extremely rapid rate. The sudden wealth from increased oil production provided Saudi Arabia with economic prosperity. With help from neighbouring countries and western countries, and with large influx of foreigners, the infrastructure systems necessary for the operation of a modern society have been established. As a result, cultural, social, and economic modernization at an enormous scale has been witnessed. The healthcare services have also witnessed similar rapid developmental changes. An overview of the development of the Saudi healthcare system will be discussed in chapter 5.

As a consequence of all of these developments, significant improvements of the health status of the Saudi population have been observed over time. In 1974, the first comprehensive national census showed that the population of Saudi Arabia was 7,009,466 persons.[26] Later in 1992, the official figures of the Saudi population increased to 16,948,388 with an increase percent of 141.8%.[27] The most recent census in 2010 put the figures of the Saudi population at 27,136,977 persons. [28] This rapid growth within almost 4 decades could be attributed to the high fertility rate and the decline in mortality rates as shown in table 1 and figure 1. It also could be attributed to a large number of foreigners (8,429,401 in 2010). [28]

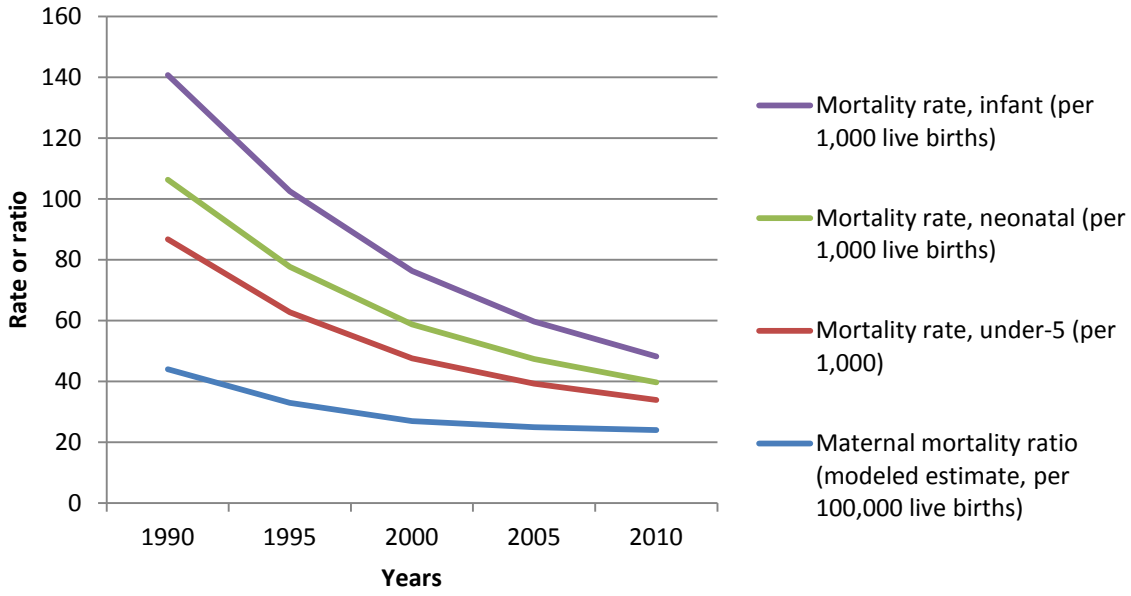
The increased access to improved sanitation and clean water sources as well as the high immunization coverage against the majority of vaccine preventable diseases played an important role in improving the health status of the Saudi population (Table 2, Figure 2, and 3).

**Table 1: Demographic indicators for Saudi Arabia, 1992-2012**

| Demographic Indicators | 1992 | 1996 | 2000 | 2004 | 2008 | 2012 |
|---|---|---|---|---|---|---|
| **Population** | | | | | | |
| Midyear Population (in thousands) | 17,061 | 19,293 | 21,312 | 23,200 | 24,917 | 26,535 |
| Growth rate (percent) | 3.4 | 2.8 | 2.3 | 1.9 | 1.7 | 1.5 |
| **Fertility** | | | | | | |
| Total fertility rate (births per woman) | 5.5 | 4.8 | 3.9 | 3.1 | 2.6 | 2.3 |
| Crude birth rate (per 1,000 population) | 34 | 29 | 26 | 23 | 21 | 19 |
| Births (in thousands) | 578 | 567 | 559 | 529 | 511 | 509 |
| **Mortality** | | | | | | |
| Life expectancy at birth (years) | 71 | 71 | 72 | 72 | 73 | 74 |
| Infant mortality rate (per 1,000 births) | 26 | 24 | 22 | 21 | 18 | 16 |
| Under 5 mortality rate (per 1,000 births) | 31 | 29 | 26 | 24 | 21 | 18 |
| Crude death rate (per 1,000 population) | 4 | 4 | 4 | 4 | 3 | 3 |
| Deaths (in thousands) | 76 | 77 | 79 | 83 | 84 | 88 |
| **Migration** | | | | | | |
| Net migration rate (per 1,000 population) | 5 | 2 | 0 | 0 | 0 | -1 |
| Net number of migrants (in thousands) | 77 | 41 | 7 | 4 | -11 | -17 |

*Source: U.S. Census Bureau, 2012* [25]

**Figure 1: Mortality indicators for Saudi Arabia, 1990-2010**




*Data source: The World Bank data, Health, Nutrition and Population Statistics database, 2012* [29]

**Table 2: Public health indicators for Saudi Arabia, 1985-2010**

| Indicator Name | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|---|
| **Immunization** | | | | | | |
| BCG (% of one-year-old children) | 89 | 90 | 94 | 94 | 96 | 98 |
| DPT (% of children ages 12-23 months) | 81 | 92 | 96 | 95 | 96 | 98 |
| Hep B (% of one-year-old children) | -- | 66 | 93 | 93 | 97 | 98 |
| Measles (% of children ages 12-23 months) | 79 | 88 | 94 | 94 | 97 | 98 |
| Polio (% of one-year-old children) | 81 | 92 | 96 | 95 | 96 | 98 |
| **Sanitation** | | | | | | |
| Improved sanitation facilities (% of population with access) | -- | 81 | 81 | 86* | -- | 99* |
| Improved water source (% of population with access) | -- | 89 | 90 | 93* | 89* | 100* |
| **Infectious diseases** | | | | | | |
| Incidence of tuberculosis (per 100,000 people) | -- | 17 | 17 | 20 | 17 | 18 |
| Measles (number of reported cases) | -- | -- | -- | 617* | 373* | 336* |
| Malaria (number of reported cases) | 16,242 | 15,666 | 18,751 | 6,608 | 1059* | 1941* |
| Bilhariziasis (number of reported cases) | -- | -- | -- | 1159** | 497+ | 120+ |
| **Urbanization** | | | | | | |
| Urban population (% of total) | 72.6 | 76.6 | 78. 7 | 79.8 | 81.0 | 82.1 |
| Urban population growth (annual %) | 7.2 | 4.4 | 2.6 | 2.6 | 3.8 | 2.6 |

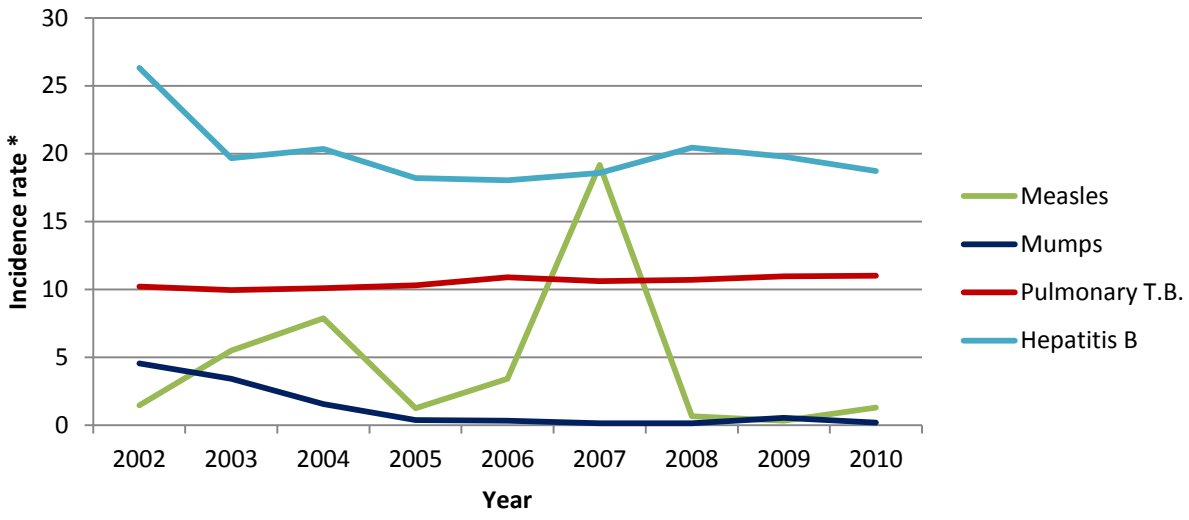
*Sources: The World Bank data: Health, Nutrition and Population Statistics database, 2012.* [29]

**WHO: Global Health Observatory (GHO), country statistics, Saudi Arabia, 2012.*[30]

*** For 2002, MOH, health statistical year book, 2002, Saudi Arabia.*[31]

*+ MOH, health statistical year book, 2005-2010, Saudi Arabia.*[31]

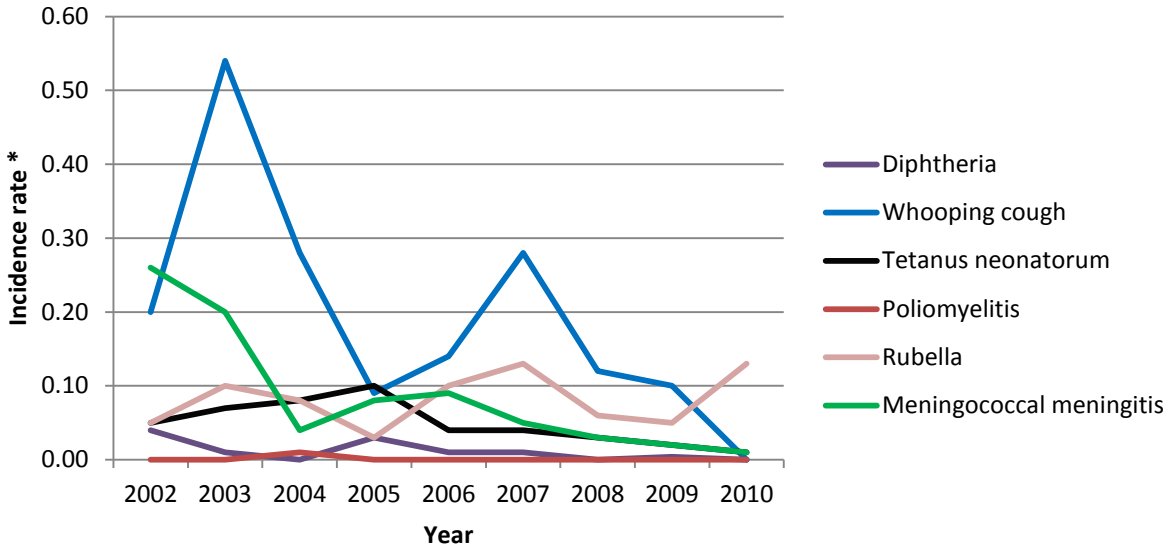
**Figure 2: Incidence rates of vaccine preventable diseases (1), 2002-2010**




*Data source: MOH, health statistical year book, 2002-2010, Saudi Arabia.*[31]

** Incidence rate/100,000 population.*

**Figure 3: Incidence rates of vaccine preventable diseases (2), 2002-2010**

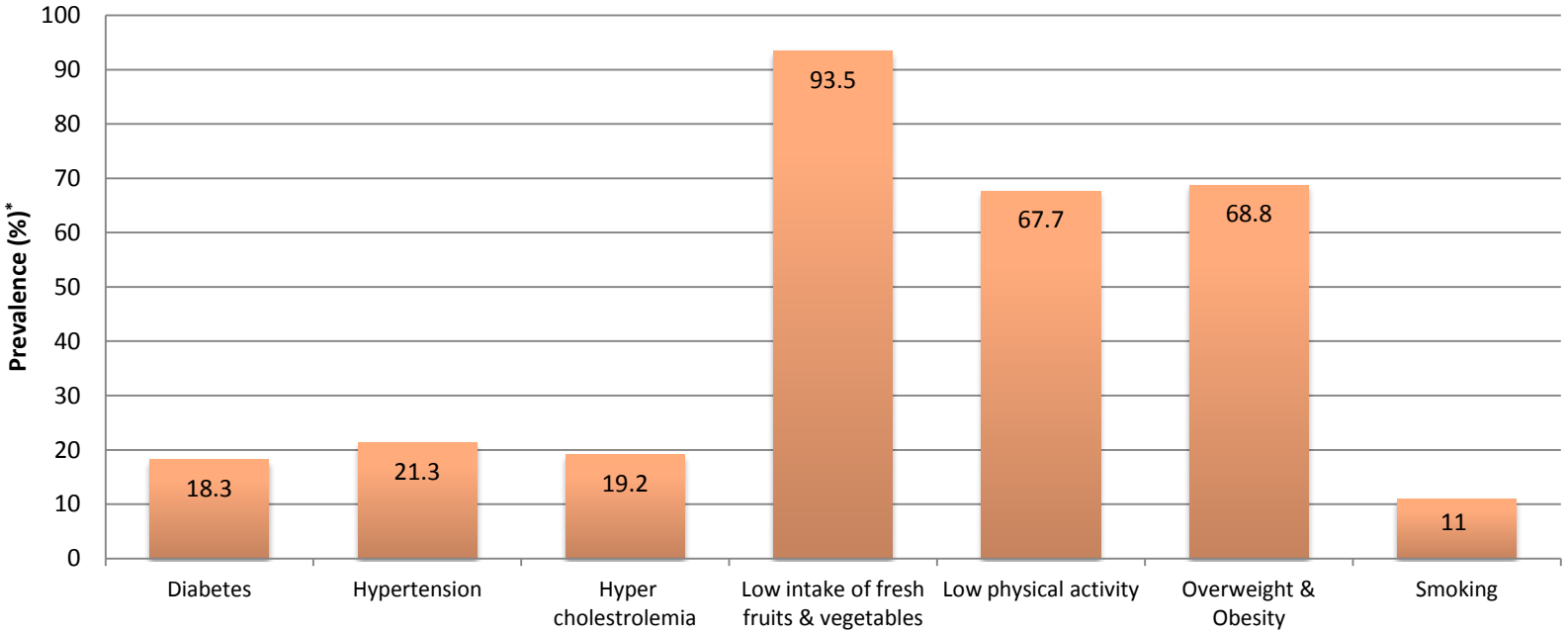



*Data source: MOH, health statistical year books, 2002-2010, Saudi Arabia.*[31]

** Incidence rate/100,000 population except for tetanus neonatorum which is /1000 Live births.*

However, rapid modernization is a mixed blessing. Cultural and social lives rapidly developed but at the same time were associated with adopting unhealthy lifestyle choices such as cigarette smoking, physical inactivity, poor diet and inadequate sleep hygiene. Furthermore, a significant rise in the prevalence of obesity, diabetes, hypertension and cardiovascular disease has accompanied these lifestyle changes (Figure 4), particularly among the urban populations. [32-33]

**Figure 4: Prevalence (%) of some chronic diseases and its risk factors in Saudi Arabia, 2007**




*Source: WHO: Global Health Observatory (GHO), country statistics, Saudi Arabia, 2012.*[30]

* ***Diabetes****: FBS ≥ 7 mmol/dl;* ***Hypercholesterolemia****: cholesterol level ≥ 5.2mmoL/dl;* ***Hypertension****: BP ≥ 140/ 90 mmHg;* ***Low intake of fresh fruits and vegetables****: ≤ 5 serving per day;* ***Low physical activity****: daily activity ≤ 10 minutes;* ***Overweight and Obesity****: BMI ≥ 25 mg/m$^2$;* ***Smoking****: current daily smokers.*

In summary, over the past 4 decades, the government of Saudi Arabia has achieved remarkable progress in improving the health status of Saudi population. However, this achievement was accompanied by remarkable negative lifestyle changes that led, accompanied by possible genetic susceptibility, to increased prevalence of some chronic diseases such as diabetes and its risk factors.

## 1.3. The scale of the problem of diabetes in Saudi Arabia

In the Kingdom of Saudi Arabia, diabetes is one of the major national health issues. The National Medical and Health Research Strategy for the Kingdom identified diabetes as a national health priority area for research and strategic intervention.[34] Some studies have looked at different aspects of the problem of diabetes in Saudi Arabia over the last four decades. This section will discuss in depth the time trend of diabetes development in Saudi Arabia, the current high prevalence of diabetes and its risk factors. It will also show the current state of diabetes control and its complications, and the huge burden of diabetes in Saudi Arabia including its mortality, morbidity and costs.

### 1.3.1. *Prevalence of diabetes*

Diabetes Mellitus is now considered to be one of the most common non-communicable chronic diseases globally. In 2011, there were 366 million people with diabetes, and this is expected to rise to 552 million by 2030.[35] Arabian Gulf countries are among those with the highest prevalence worldwide.[36] The International Diabetes Federation (IDF) estimates that the prevalence of diabetes in Saudi Arabia for the 20-79 years age group is 19.6%, which is one of the 10 highest prevalence proportions in the world. In 2030, almost a quarter of the population is expected to have diabetes (22.3%).[35, 37]

The time trend and geographical variations of diabetes development in Saudi Arabia over the past 4 decades can be described across three time periods:

1975-1989
1990-1999
2000-2012

***The first period: 1975-1989:***

*Overall prevalence:*

Little was known about diabetes prevalence in Saudi Arabia before 1975. Professor Cook was one of the earliest authors who referred to the prevalence of diabetes in Saudi Arabia.[38] He claimed, in an unpublished study, that impaired glucose tolerance and maturity onset diabetes were common among Arabs in Riyadh, most of whom were not obese. In an another study, he reported that this might be due to the rapid glucose absorption in Saudi Arabs as compared with African people from Zambia.[38]

In the early eighties, Bacchus et al, in a rural area near Riyadh, showed that diabetes prevalence among females (4.7%) was almost twice that of males (2.5%).[39-40] Two hospital based case series studies reported that T2DM was the most common type of diabetes (83-94%).[41-42] In the mid-eighties, Fatani et al estimated a higher prevalence of diabetes (4.9%) in the urban population of the western region of Saudi Arabia than in the rural population (4.3%).[43-44] In 1989, a comparative study reported a higher frequency (7.9%) of hyperglycaemia (fasting blood glucose (FBG) ≥ 7.2 mmol/l) with marked variation among different areas of Saudi Arabia. [45] In 1990, Anokute published the first period prevalence study which involved screening of 3158 males in a University community between December 1985 and April 1987.[46] In this urban population, the study showed an ongoing trend of rising prevalence (6%) of hyperglycaemia (FBG ≥ 7.8 mmol/l). In another study (1989), a similar prevalence

(5.5%) among males was reported in a semi urban community near Abha city in the southern region of Saudi Arabia.[47] The overall prevalence of hyperglycaemia for both males and females was lower (4.6%), being significantly higher among males than females (3.6%).

The prevalence of impaired glucose tolerance (IGT) was reported to range from 1.1% to 3.7%.[43-44, 47] Overweight, obesity, age and higher income were common risk factors among people with diabetes. [39-40, 43-44, 46]

*T1DM:*

Only a few studies from Saudi Arabia have specifically explored the incidence and prevalence of T1DM. The earliest one was an unpublished, retrospective, hospital based study which was conducted over 2 years (1980-1982) at a company (ARAMCO) hospital in the eastern province of Saudi Arabia. The incidence and prevalence of T1DM, in the age group of 0 – 14 years, were estimated to be 7 per 100,000 per year, and 20 per 100,000 respectively.[48-49] This incidence rate was higher than that reported by a population based study from Kuwait around the same time (3.96 per 100,000 per year).[50]

In the age group of 0 – 14 years of an urban community, Fatani et al in 1989 found that the prevalence of diabetes mellitus was 0.3%, which in this age group can be taken as an indicator of the prevalence of T1DM.[43] In addition, El-Hazmi et al reported that the bimodal distribution of hyperglycaemia among the male populations of Gizan and Khaybar cities might indicate that T1DM and maturity onset diabetes of youth (MODY) prevalence was higher than in the other cities included.[45]

A descriptive study of 1000 consecutive case notes of patients with diabetes at hospital settings showed that the proportion of T1DM was 11.7% based on the criteria of either diagnosing diabetes under age of 15 years or occurrence of ketoacidosis with insulin dependent control of glucose level.[42] Of these patients 64.3% were male.

*Maturity onset diabetes of youth (MODY):*

In 1981, a hospital based study in Jeddah reported that MODY was not a rare problem after identifying 3 cases out of 65 in-patients with diabetes seen over a period of one year at King Abdulaziz University hospital.[51] Fonseca et al in Riyadh identified, in a series of 200 patients with diabetes attending a diabetes clinic, 9 cases of MODY who were below 30 years old, not obese and did not develop ketosis. Famuyiwa et al reported a proportion of 4.4% of early onset non-insulin dependent diabetes among 1000 patients with diabetes, based on the criteria of being diagnosed under the age of 30 years plus control of diabetes with diet or oral tablets and a positive diabetes history among the first degree relatives. Therefore, MODY was not an uncommon disease in Saudi Arabia at this time period.

*Gestational diabetes mellitus (GDM):*

Diabetes was occasionally seen in an obstetric unit at Riyadh Military Hospital in 1979.[52] A decade later, a University hospital based study in the same city revealed a dramatic change. The study showed an overall prevalence of abnormal OGTT of 10.3% (112 of 1088) according to the WHO 1985 diagnostic criteria,[53] with 21 (1.9%) women having GDM and 91 (8.4%) having gestational impaired glucose tolerance.[54] The study also showed that GDM was related to some maternal characteristics such as increasing age, parity and weight. In another published case series study, the same authors

confirmed their earlier findings and showed that impaired glucose intolerance during pregnancy is a risk factor.[55]

In 1989, a University hospital based study in another city, screened 455 consecutive pregnant women. Using a different method of glucose testing and different diagnostic criteria, the incidence of gestational diabetes was found to be 11% and that incidence increased with increasing maternal age, parity and weight.[56] However, in a study where adolescent pregnant women of 18 years of age or less were compared with pregnant women aged 20 to 29 years, maternal age per se was not found to affect the pregnancy outcomes or complications including diabetes.[57] Among multiparous women, Alsibai et al in 1987 reported a higher incidence of diabetes mellitus while Mwambingu et al in 1988 reported a particular increased incidence of gestational diabetes.[58] Infants of mothers with diabetes experienced shoulder dystocia more often than those without diabetes.[59]

Mesleh et al screened 2010 pregnant women at the initial visit and found 15.6% had abnormal OGTT using WHO 1985 criteria.[53] After follow up OGTTs, the incidence dropped down to 3.5% (71), with 0.6% (13) diagnosed as having gestational diabetes and 2.9% (58) had impaired glucose tolerance. The study also confirmed the relation between abnormal OGTT and the increasing age or parity.[60]

In summary, many of the early studies did not separate between the different types of diabetes but reported on the overall prevalence. The prevalence of T1DM was not specifically examined at a population level during the period of 1975 to 1990. Few studies described the clinical patterns and characteristics of patients with T1DM. Some studies reported on the prevalence of hyperglycaemia rather than the confirmed

diagnosis of diabetes.[45, 47] Both diabetes and impaired glucose tolerance were rising steadily over this period. The studies on gestational diabetes used different diagnostic criteria and glucose testing methods which make it difficult to compare the incidence of gestational diabetes across the studies. However, the mounting evidence suggests that gestational diabetes incidence is influenced by maternal age, parity and obesity.

*Limitations of the studies of the first period:*

The majority of the studies conducted during this period (1975 – 1989) shared several limitations. First, almost all the studies were regional or city based studies rather than national based. Second, apart from Fatani et al study,[43] all of the studies had relatively small sample sizes. Third, the sampling methods were not reported clearly. Some studies involved only men with special characteristics such as being salaried workers (Bacchus et al, 1982) or being University staff (Anokute, 1990) which limits their generalizability. In most of the studies, the OGTT was the main test for diagnosis of diabetes using either the WHO 1980 or WHO 1985 diagnostic criteria.[53, 61] However some studies used modified criteria or other different criteria. [45, 47, 56]

In spite of the many limitations of the studies of this time period, they indicate the trend of rising diabetes prevalence in Saudi Arabia. The studies demonstrated correlations of diabetes with some risk factors such as age, gender, obesity, parity and the socio-economic classes.

***The second period: 1990-1999:***

*Overall prevalence:*

During the first half of the nineties of the last century, two national household surveys were conducted to determine the prevalence of diabetes and some other chronic diseases in Saudi Arabia. The first one was conducted by Elhazmi et al in 34 different areas of the county. It involved both sexes from urban and rural areas with a total of 23,493 subjects of age ranging from 2 to 70 years.[62] The second national survey was conducted by Alnuaim et al at almost the same time. It also involved both urban and rural areas as well as both males and females with a total sample size of 13,177 subjects over the age of 15 years. [32]

Despite the fact that both surveys used the same diagnostic criteria (WHO's 1985)[53], different screening methods were used which limits a valid comparison. Elhazmi et al used a glucometer to immediately measure whole blood glucose during fasting and after oral glucose load (OGTT), while Alnuaim et al measured the plasma glucose level by analysing the collected, frozen plasma samples in a central laboratory at King Saud University in Riyadh. Alnuaim et al also used first the random plasma glucose level as a screening method and subsequently performed OGTT for those of borderline glucose values (5.5 to 11.1 mmol/l). However, using the random plasma glucose is not a recommended screening method for diabetes as it can miss a significant number of patients and gives only a crude estimate of the prevalence of diabetes in a population. [53]

Elhazmi et al published a series of 9 articles from 1995 to 2000 on the findings of their national survey.[63-71] The main article was published in 1996 in the Annals of Saudi

Medicine.[66] It revealed an overall prevalence of 5.2%. When separated on the basis of sex, 5.7% of men and 4.8% of women had diabetes. The corresponding values for impaired glucose tolerance were 0.5% for men and 0.9% for women and the overall prevalence was 0.7%.

A significantly higher prevalence was observed with age. When children less than 14 years were excluded, the overall prevalence of diabetes increased to 8.2%, with 9.74% for men and 7.06% for women. The corresponding values for impaired glucose tolerance increased to 0.72% for men and 1.35% for women and the overall prevalence was 1.079%. The highest prevalence of diabetes was among subjects from Taif in the western (Makkah) province. Later in 1998, the same authors published a follow up article with an additional 1844 subjects which gave a total sample size of 25,337 subjects.[69] Almost the same findings were reported again.

The other national survey by Alnuaim was published in 1995 as a governmental report and in 1997 as a single author study.[32, 72] The survey was able to estimate the age adjusted prevalence of diabetes and to map out the age, sex and regional differences in diabetes prevalence in both urban and rural areas. The age adjusted prevalence of diabetes was significantly higher among the urban population (males 12 %, 95% confidence interval (CI) =11–13% and females 14 %, 95% CI =13–15%) than in the rural population (males 7%, 95% CI= 7–8% and females 7.7%, 95% CI= 7–9%). The age specific prevalence of diabetes increased with age from 2% for females aged 15-20 years to 49% for females aged 51-60 years of the urban population. The corresponding values for the same age groups in the rural population were 1% to 26%. The study in addition showed that family history of diabetes, obesity, region of residence were

associated significantly with diabetes. The highest prevalence among males (17.6%) was found in the Eastern region and the highest among females (18.6%) was in the Northern region.

The prevalence of IGT was 9.5% for all, 10% for male subjects and 9% for female subjects. The urban population had higher prevalence of IGT (males 10%, females 11%) than the rural population (males 8%, females 8%).

In Aseer region, Mahfouz et al reported that the recorded age adjusted prevalence of diabetes mellitus at the primary health care level among those aged > 15 years was 2.9%.[73] The prevalence increased with age and was significantly higher among males. In Alkharj city, a review of a random sample of 3747 case notes of patients attending a primary healthcare clinic showed an overall diabetes prevalence of 4.08%.[74] In contrast with the Mahfouz et al study, this study reported a higher prevalence among females (5.32%) than males (2.55%).

*T2DM and T1DM:*

The first study that estimated the prevalence of T1DM and T2DM at the national level was that by Elhazmi et al in 1996.[66] The overall prevalence of T1DM and T2DM was 0.21% and 4.99% respectively. In the male population, the prevalence of T1DM and T2DM was 0.19% and 5.50%, while in the female population, the prevalence was 0.23% and 4.55% respectively.

The sex difference in the prevalence of T2DM was statistically significant and it rose with age from 0.38% in males aged 14 -29 years to 28.75% in males aged > 60 years and from 0.98% in females aged 14-29 years to 24.37% in females aged > 60 years.

Furthermore, the prevalence of T1DM among children (< 14 years old) was 0.17% which gives a prevalence of 1.7/1000 children. The study also calculated the prevalence of T2DM in the different cities of Saudi Arabia which is presented in figure 5. In a follow up study, Elhazmi et al showed that obesity prevalence was significantly higher among patients with diabetes than those without diabetes in each region of Saudi Arabia.[71]

In the eastern region, a hospital based study revealed an increase in the incidence of T1DM over a period of twelve years (1986-1997).[75] The age adjusted incidence rate increased from 3.2 per 100,000 in 1986 to 22.6 per 100,000 in 1997 with an overall age adjusted incidence rate of 12.3 per 100,000 ( 9.9 per 100,000 for boys and 14.8 per 100,000 for girls). The increase was greater in girls and in those aged more than 10 years.

*MODY:*

Elhazmi et al in their national survey identified thirteen children with MODY which gives a prevalence of 0.148% among children aged < 14 years and an overall prevalence of 0.055%.[66] Those 13 cases were considered to be MODY cases based on being having a positive family history of diabetes and controlling their diabetes by oral hypoglycaemic drugs. However, MODY diagnosis has not been confirmed by the authors.

*GDM:*

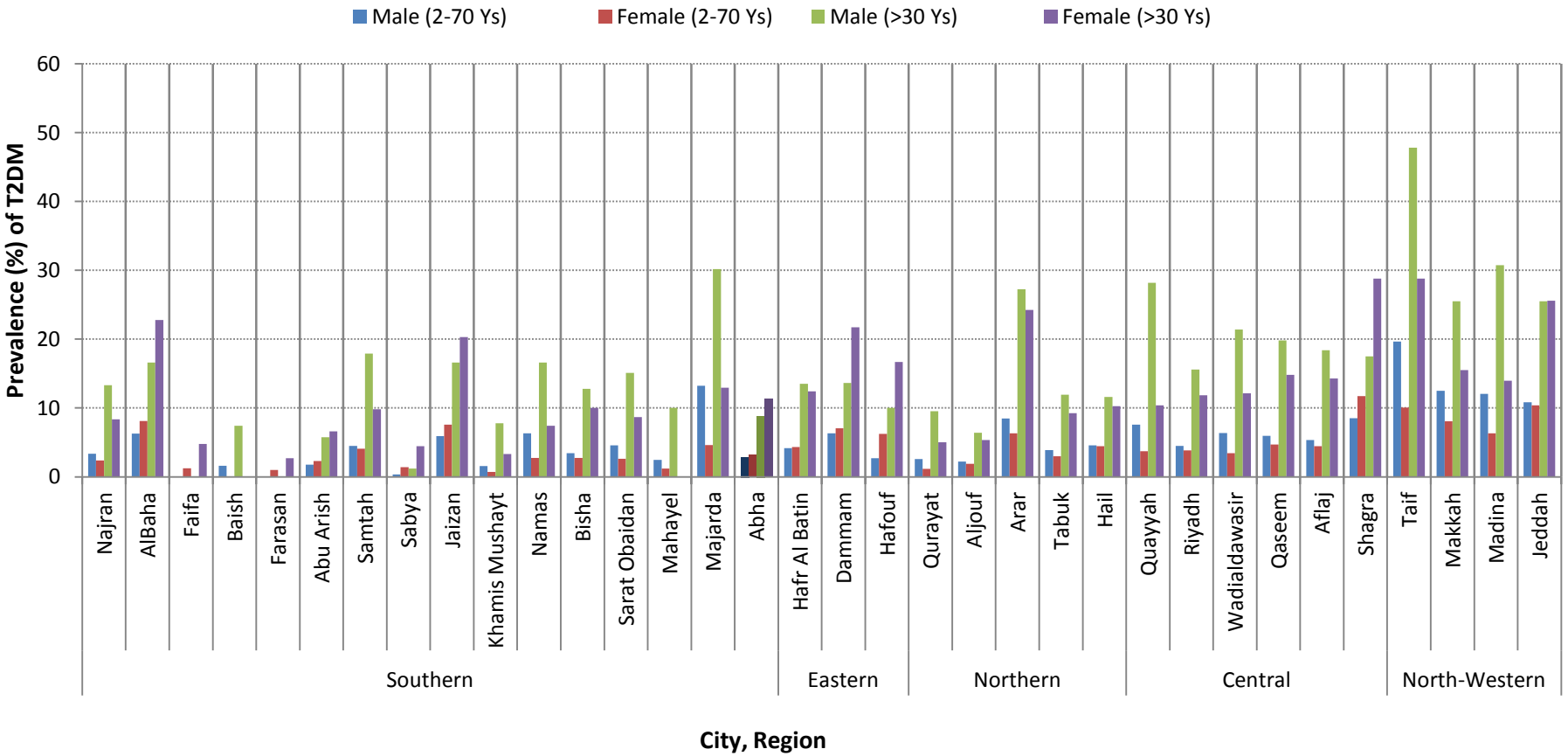
In 1996 to 1998, Ardawi et al used the National Diabetes Data Group (NDDG) criteria to screen for GDM a total of 818 randomly recruited pregnant females who attended antenatal clinics at two hospitals in Jeddah.[76] The prevalence of GDM was 12.5%

which was much higher than had been estimated earlier in Alkhobar and Riyadh cities.[54, 56, 60] However, it should be kept in mind that different diagnostic criteria were used across the studies which may explain the large differences of GDM prevalence among different cities.

*Limitations of the studies of the second period:*

The studies on the prevalence of diabetes during this time period (1991 – 1999) featured two national surveys which avoided the many limitations of the studies of the previous decade (1975 – 1990). However, some of the articles that were published between 1991 and 1999 were limited geographically to a specific area or were clinic or hospital based studies.[73-76] Only one study on the prevalence of T1DM and another one on the prevalence of GDM were published. However, both were hospital based and limited to specific areas.[75-76] The prevalence of diabetes varied widely among the studies; however, the overall prevalence appeared to continue its rising trend. The studies showed that age, overweight, obesity and family history of diabetes were higher among those with diabetes.

## Figure 5: Prevalence of T2DM in different cities of Saudi Arabia




*Data source: Elhazmi, 1996.*[66]

***The third period: 2000-2012:***

*Changes in diagnostic criteria for diabetes:*

Most of the studies on the prevalence of diabetes that were done in the 1990s used the WHO's 1985 diagnostic criteria.[53] By contrast, most studies published after 2000 used the WHO's 1999 diagnostic criteria[77] or the ADA 1997 diagnostic criteria[78], which lowered the diagnostic cut off value for fasting plasma glucose (FPG) from ≥ 7.8 mmol/l to ≥ 7mmol/l. In addition, a new category called impaired fasting glucose (IFG) which was defined as a FPG values between ≥ 6.1mmol/l to ≤ 6.9 mmol/l was introduced. In 2003, the ADA reduced the lower cut off value of this new category from ≥ 6.1mmol/l to ≥ 5.6 mmol/l (Table 3). This raised concerns within WHO about the impact of a significant increase in IFG prevalence on individuals and healthcare systems.[79] Therefore, WHO in 2006 maintained the lower cut off value for IFG at 6.1 mmol/l.[8] The WHO justified this decision by arguing that the choice of lowering the cut off point of IFG to 5.6 mmol/l in order to reduce the future risk of progression to diabetes or to its complications was not supported by evidence (Table 3).[8]

**Table 3: Summary of WHO and ADA diagnostic criteria for diabetes mellitus and intermediate hyperglycaemia at different points in time***

| | WHO 1965[80] | WHO 1980[61] | WHO 1985[53] | ADA 1997[78] | WHO 1999[77] | ADA 2003[79] | ADA 2010[81] | WHO 2011[82] |
|---|---|---|---|---|---|---|---|---|
| **Normal** | | | | | | | All the ADA 2003 criteria retained. **HbA1c** test can be used to diagnose diabetes, with a threshold of ≥6.5%. **HbA1c** values between 5.7-6.4% are defined as the high risk range for diabetes (pre-diabetes) | All the WHO 1999 criteria retained. **HbA1c** test can be used as a diagnostic test for diabetes with a recommended value of 6.5% as the cut point for diagnosing diabetes. There is currently insufficient evidence to make any formal recommendation on the interpretation of HbA1c levels below 6.5%. |
| FPG | Not specified | Not defined | Not defined | <6.1 mmol/l | <6.1 mmol/l | <5.6 mmol/l | | |
| 2-h PG | <6.1 mmol/l | -- | -- | <7.8 mmol/l | Not specified but <7.8 mmol/l implied | <7.8 mmol/l | | |
| **Diabetes** | | | | | | | | |
| FPG | Not specified | ≥8.0 mmol/l and /or | ≥7.8 mmol/l or | ≥7.0 mmol/l or | ≥7.0 mmol/l or | ≥7.0 mmol/l or | | |
| 2-h PG | ≥7.2 mmol/l | ≥11.0 mmol/l | ≥11.1 mmol/l | ≥11.1 mmol/l | ≥11.1 mmol/l | ≥11.1 mmol/l | | |
| **IGT** | | | | | | | | |
| FPG | -- | <8.0 mmol/l and | <7.8 mmol/l and | Not required | <7.0 mmol/l and | Not required | | |
| 2-h PG | 6.1 – 7.1 mmol/l | ≥8.0 mmol/l and <11.0 mmol/l | ≥7.8 mmol/l and <11.1 mmol/l | ≥7.8 and <11.1 mmol/l | ≥7.8 and < 11.1 mmol/l | ≥7.8 and <11.1 mmol/l | | |
| **IFG** | | | | | | | | |
| FPG | Not defined | Not defined | Not defined | ≥6.1 and <7.0 mmol/l | ≥6.1 and <7.0 mmol/l and | 5.6 to 6.9mmol/l | | |
| 2-h PG | -- | -- | -- | -- | <7.8 mmol/l (if measured) | <11.1 mmol/l (if measured) | | |

**Values represent venous plasma glucose, FPG: Fasting Plasma Glucose, 2-h PG: 2-hours Plasma Glucose after ingestion of 75g oral glucose load, IGT: Impaired Glucose Tolerance, IFG: Impaired Fasting Glucose, HbA1c: Glycated Haemoglobin, ADA: American Diabetes Association, WHO: World Health Organization*

*Overall prevalence:*

Using the new ADA criteria, Alnozha et al designed a national population based survey to assess the prevalence of diabetes mellitus and coronary artery disease in Saudi Arabia.[83] Over a period of 5 years between 1995 and 2000, 16917 Saudi subjects aged between 30-70 years were screened for glucose intolerance. The overall prevalence of diabetes mellitus obtained was 23.7% (26.2% for men and 21.5% for women). The age adjusted prevalence was estimated at 21.9% (22.4% for men and 21.5% for women). The prevalence increased with advancing age from 12.1%, among those aged between 30 to 39 years, to 36.5% at age of 60 to 70 years. Diabetes mellitus was more prevalent in urban populations (25.5%) than in rural populations (19.5%). Of those with diabetes, 27.9% were unaware of having diabetes. Furthermore, similar to what has been reported before by both Elhazmi et al and Alnuaim et al national studies, Alnozha et al reported that the southern region had the lowest prevalence (18.2%).

Alnozha et al also estimated the prevalence of the new defined IFG category (≥ 6.1mmol/l to ≤ 6.9 mmol/l). Its crude prevalence was 14.1% and the age adjusted prevalence was 13.9%. The age adjusted IFG prevalence was similar in both males (14.2%) and females (13.9%). These prevalence proportions for IFG were much higher than what have been previously reported for IGT. The study also demonstrated an association between higher proportions of diabetes with central obesity particularly among females.

In 2004, another national survey was conducted by the Saudi Ministry of Health (MOH) in collaboration with the WHO.[84] The WHO STEPwise approach to surveillance of non-communicable diseases was used to ensure standardization and comparability with

international data. Diabetes mellitus prevalence was found to be 15.3% with similar prevalence for males (15.8%) and females (14.9%). A similar prevalence (15.8%) was reported in a case series study in Riyadh city among the attendees of 4 primary healthcare centres.[85] However, the study reported a higher prevalence among males (24.2%) than females (11.3%).

Among those aged ≥ 30 years, a screening campaign in the Eastern region of Saudi Arabia found that 17.2% of 197,681 participants had diabetes and 9% of those with diabetes were newly diagnosed.[86] The prevalence increased with age, and was higher among subjects who were unemployed, illiterate, widowed, divorced or had a low education level or income. In contrast to Alnozha and the MOH national surveys, this study found that females had higher diabetes prevalence (18.6%) than males (15.9%).

In Alriyadh region, a recent population based study which screened Saudis aged 7-80 years for T2DM showed a crude prevalence of 23.1% and an aged adjusted prevalence of 31.6% which is the highest adjusted prevalence ever reported (based on WHO 1999 diagnostic criteria).[87] The study found also that the age adjusted prevalence of T2DM was higher in men (34.7%) than in women (28.6%) which was consistent with the findings of the national surveys of Elhazmi, Alnozha and the MOH.

In the western region, two recent studies were conducted in Jeddah. The first one used questioning patients to determine the presence of diabetes among patients attending a primary healthcare clinic. Of 6024 subjects, diabetes mellitus was present in 1792 (30%) patients.[88] The second study screened overweight and obese pediatric patients attending a hospital clinic for the presence of T2DM. Over a 4 years period, 387

patients aged from 2 to 18 years were screened using the ADA 2003 criteria. Of which 35 patients (9%) had T2DM.[89]

*T1DM:*

Three studies were conducted to estimate specifically the prevalence or incidence of T1DM between 2000 and 2012 in Saudi Arabia.[90-92] One was a national study conducted between 2001 to 2007 by Alherbish et al and the other two were city based studies.

The national study was the first study of its kind to estimate the prevalence of T1DM among children and adolescents aged less than 19 years.[90] Since T1DM is typically in most of the cases, a self-evident disease, a questionnaire was used to document the presence of diabetes in the targeted family members of the randomly selected households. The study found that the prevalence of T1DM was 109.5 per 100,000. The central region had the highest prevalence of 162 per 100,000 while the eastern region had the lowest prevalence of 48 per 100,000.

Over a period of 18 years (1990 to 2007), a subpopulation based study revealed an alarming increase in the incidence rates of T1DM among children less than 15 years of age. The annual incidence rate increased from 10.13 per 100,000 per year in 1990 to 52.93 per 100,000 per year in 2007. The average incidence rate was 27.52 per 100,000 per year and the average annual increment in incidence rate was 16.8%.

A city based study was conducted in Almadinah city which is the largest city in the northwest of Saudi Arabia. Over a period of 6 years (2004 to 2009), the mean annual age adjusted incidence rate was 29.0 per 100,000 person-years of children aged 0 – 12

years, which was the highest reported incidence in the Middle East and North Africa region. [92] The incidence was higher in girls (33 per 100,000) than boys (22.2 per 100,000) and in children aged 10-12years (46.5 per 100,000) than in children aged 0-4 years (17.1 per 100,000).

Recently, the IDF in 2011, estimated the incidence of T1DM in children of 0 to 14 years old to be 31.4 per 100,000. [37]

*MODY:*

The exact incidence and prevalence of MODY is not known in Saudi Arabia. Recently, it has been suggested that testing for MODY in Saudi Arabia should not be considered routinely but for selected patients where clinical and biochemical indicators dictating that.[93]

*GDM:*

A hospital based study screened 633 pregnant women who attended a hospital antenatal clinic in Riyadh for GDM. The prevalence of GDM was 12.5% when the WHO's 1999 criteria were applied (2-h PG ≥ 7.8 mmol/l). However, the prevalence dropped to 3.8% when the ADA criteria were used (2-h PG ≥ 8.6 mmol/l). In addition, the study showed that the prevalence of GDM increased with parity. However, this was shown to be due to the confounding effect of maternal age.[94]

*Limitations of the studies of the third period:*

The studies on the prevalence of diabetes during this time period (2000 – 2012) have used mainly fasting blood glucose as a screening method instead of OGTT or random blood glucose. In contrast, the studies on T1DM used either self-reported history or hospital data to identify patients with diabetes. The studies of this period pointed to

the exponential rise of diabetes prevalence. However, this rise can be explained in part by the lowering of the diagnostic criteria for diabetes, (Table 3) which will increase diabetes prevalence and make the rise look larger than it really was. Involving young and older age groups rather than children would also explain, in part, this rise. However, confirming the rising trend of diabetes in Saudi Arabia by conducting a valid comparison between studies, either within each time period or between the three periods, was not feasible. This was because of the heterogeneity among the studies in terms of the screening methods used, the diagnostic criteria and the sampled age ranges as well as involving different genders and specific subpopulations. This is shown in appendices 1, 2 and 3 which summarize the characteristics of the prevalence studies of diabetes in Saudi Arabia for the last 3 decades. Furthermore, the incidence of T1DM seems to be increasing at dramatically higher rates compared to the reported global trend, and with unclear etiological factors.[95-96]

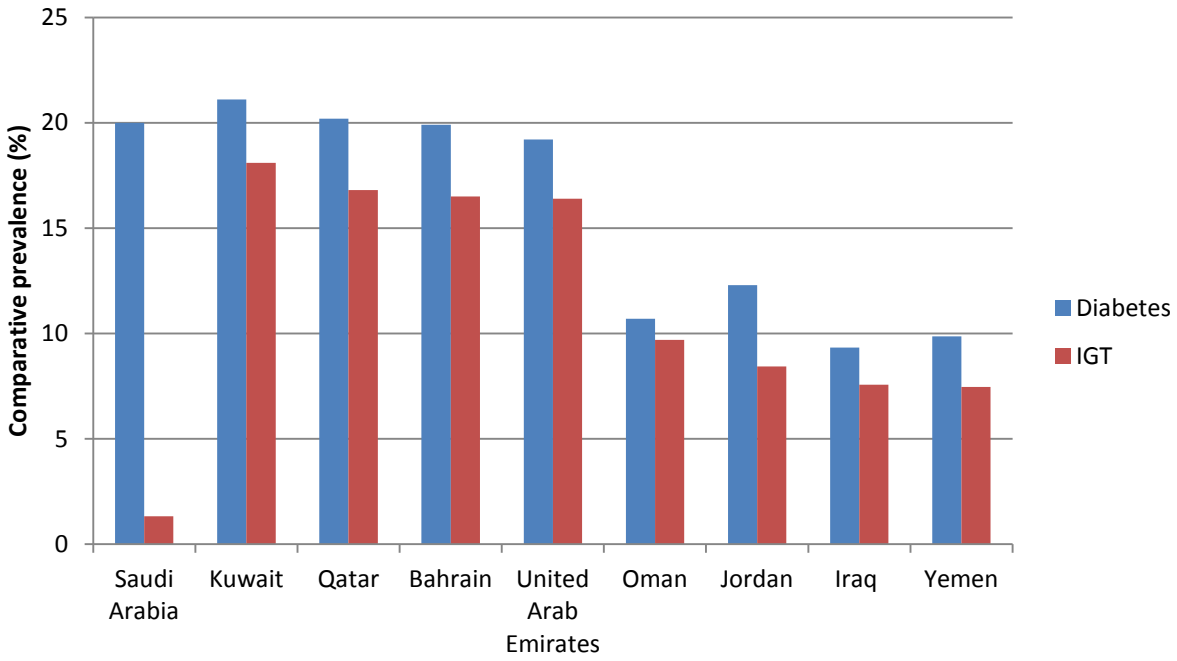
### 1.3.2. *Modifiable risk factors for diabetes*

***Impaired glucose tolerance (IGT):***

At the global level, the prevalence of IGT is almost the same to that of diabetes, with somewhat higher prevalence in the Africa and Western Pacific Regions and slightly lower in the North America and Caribbean Region.[37] In contrast, the prevalence of IGT in Saudi Arabia was found to be much lower than diabetes prevalence which also contrasts with the neighbouring countries' situation as shown in figure 6. The IDF estimates in figure 6 were calculated using the most recent, high quality data from different sources for each country. The data were adjusted to the current WHO standard population to generate comparative estimates.[37] Therefore, this might indicate that people with IGT in Saudi Arabia progress faster to diabetes but there is no clear explanation for this.

This interpretation might be supported by the findings of a recent review study which reported that the lowest BMI threshold where diabetes risk escalates was reported in Saudi Arabia. It was as low as 21 $kg/m^2$ in one study from Saudi Arabia while it was predominantly 30 $kg/m^2$ in most other studies from the countries in the Middle East and North Africa.[97]

**Figure 6: IDF estimates of diabetes and IGT prevalence (%) for 2011 (20-79 years)**[37]




***Obesity and physical inactivity:***

The previous studies on diabetes prevalence in Saudi Arabia suggested that the rising trend has probably resulted from the changes in the patterns of lifestyle such as reduced physical activity, unhealthy eating habits, urbanization and the concomitant rise of obesity and consanguinity rates. Recently (2010), Midhet et al reported a strong association between the risk of acquiring T2DM and unhealthy dietary habits, lack of exercise and education in Saudi Arabia.[98] Certain dietary patterns such as regular eating of dates and Kabsa (rice with meat dishes) are indigenous habits in Saudi Arabia. The study found that the adjusted odds ratio was 5.5 (95% confidence limits: 2.3-13.5) for regular eating of Kabsa and 1.8 (95% confidence limits: 1.0-3.3) for regular eating of dates.[98]

Obesity and weight gain are major risk factors for T2DM. A national nutrition survey in Saudi Arabia in 1985-1988 found that among participants aged 18-61 years, 30.7% of men and 28.4% of women were overweight. The prevalence of obesity was found to be higher in women (23.6%) than in men (14.2%).[99] Later, between 1995 - 2000, a community based national survey of people aged 30 - 70 years found that the prevalence of overweight was 36.9% with higher prevalence among males (42.4%) than females (31.8%). In contrast, obesity was more prevalent in females (44%) than males (26.4%). Furthermore, the age adjusted prevalence of obesity in Saudi Arabia was 35.5%.

Another national survey, which estimated the prevalence of overweight and obesity in Saudi children and adolescents aged 5 to 18 years, found that the overall prevalence of overweight, obesity and severe obesity was 23.1%, 9.3%, 2% respectively.[100] In addition, girls had a higher prevalence of overweight (23.8%) than boys (22.4%) and in contrast, boys had higher prevalence of obesity (10.1%) than girls (8.4%).

A review of the prevalence and trends of overweight and obesity in the Arabian Gulf States showed that in Saudi Arabia, Kuwait, Qatar and Bahrain two thirds to three quarters of adults and 25% to 40% of children and adolescents were either overweight or obese.[101]

The high level of physical inactivity (96.1%) among Saudi adults aged 30 to 70 years is also a major public health problem.[102] Females were found to be less active than males (98.1% versus 93.9%). The southern region of Saudi Arabia had the lowest prevalence of inactivity (94.0%; 95% CI = 93.2-94.8%) while the central region was the highest (97.3%; 95% CI = 96.8-97.8%). In 2005, another national survey used the WHO

Global Physical Activity Questionnaire (GPAQ) to estimate the levels of physical activity (high, moderate or low) among Saudi population.[84] The percentage of participants with low physical activity was 67.7% with a higher percentage among females (74.3%) than males (60.9%). Moreover, moderate and high levels of physical activity were higher in males than females (20.4% versus 12.4% and 18.7% versus 13.4%) respectively.[84]

### 1.3.3. *Diabetes control and complications*

Prolonged exposure to hyperglycaemia (raised blood glucose) leads to many pathological changes that damage the cardiovascular system at the macro and micro vascular levels. As a result, various organs of the body start to be gradually damaged. The initial changes are reversible but over time, chronic hyperglycaemia leads to irreversible damage. The United Kingdom Prospective Diabetes Study (UKPDS) and the Diabetes Control and Complications Trial (DCCT) showed that hyperglycaemia is directly associated with the severity of these complications. [5-6, 103] Intensive glycemic control was found to be the most effective method for preventing these complications.[5-6, 103]

***Glycemic control:***

In Saudi Arabia, a high proportion of patients with diabetes did not attain the recommended target of glycemic control. A national survey in 1993 showed that half (50%) of the patients with diabetes had poor glycemic control (random blood glucose (RBG) > 10 mmol/l), especially older patients and those who were on insulin treatment.[104] Seven years later, a retrospective study of patients with diabetes attending 3 primary healthcare centres in Riyadh reported a similar percentage (49%) of poor glycemic control (FBG > 10 mmol/l).[105] Six years later, another national study at the primary healthcare level showed that almost three quarters (72%) of patients with T2DM had a HbA1c level above the recommended target of < 7%.[106] A screening campaign in the Eastern region of Saudi Arabia found that only one third (33.8) of patients with diabetes attained the recommended glycemic control of FBG < 7.2

mmol/l or RBG < 10.0 mmol/l.[107] Even at the hospital level, similar proportions of poor glycemic control were reported. Qari in 2005 compared the glycemic control among the patients with diabetes who were regularly followed up at a University hospital and a private hospital in Jeddah. Poor glycemic control with HbA1C of > 8% was reported in 42% of the University hospital patients and 46% of those in the private hospital.[108] However, a similar study in the same University hospital but compared with other private hospital reported that 88.5% of patients with diabetes in the University hospital and 39.1% in the private hospital have not achieved the glycemic control goal of HbA1c less than 7%.[109]

Among the countries of the Gulf Cooperation Council (GCC), which consists of Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman; a recent systematic review concluded that consistently, less than half of patients with diabetes achieved the target glycemic control (HbA1c < 7%).[110] One study, which reported that 60.9% of privately treated patients in Saudi Arabia achieved the glycemic target, was an exception.[109-110] Moreover, a recent study in the GCC countries evaluated the effectiveness of insulin analogues in more than 10,000 T2DM patients. The study showed that the glycemic control was poor and the baseline HbA1c was 9.7 ±1.7%. [111]

### *Diabetes complications overview:*

Among the Saudi population, diabetes has been reported as a risk factor or a predictor for several diseases such as coronary artery disease, [112-115] cerebrovascular disease, [116-117] erectile dysfunction, [118-120] end-stage renal disease, [121-123] and peripheral arterial disease.[124-125] In 1986, a hospital based case series study in Riyadh estimated

for the first time that 12% of 222 patients with T2DM had retinopathy, 3.6% had nephropathy and 36% had neuropathy. Twenty eight patients (13%) had hypertension and 85% were overweight at the time of diagnosis.

A case note review study in a private hospital in Jeddah found that 60% of patients with T1DM had either one or more diabetes complications.[126] In Riyadh, a University hospital based study described the clinical pattern of diabetes and its complications in 1000 patients who visited the hospital between 1983 and 1988. The study found that retinopathy, nephropathy and neuropathy were present in 31.5%, 17.8%, and 35.9% of patients respectively.[42] Ischemic heart disease was found in 11.3%, hypertension in 25.6%, foot lesions in 10.5%, amputation in 5.1%, stroke in 9.4% and renal insufficiency in 6.9% of the reviewed patients. A similar study, but including patients with T2DM only who visited the security forces hospital in Riyadh between 1989 and 2004, found that the prevalence of retinopathy, nephropathy and neuropathy was 16.7%, 32.1%, 13.7% respectively.[127] Acute coronary syndrome, myocardial infarction and stroke were found in 23.1%, 14.3% and 10.4% respectively. Seventy eight percent of patients had hypertension, 83% had obesity, 39% had dyslipidemia, 1.9% had amputations and 4.3% had foot infections. In addition, the presence of these complications increased with duration of diabetes and age.[127]

Although diabetes complications are uncommon among children with T1DM, coronary heart disease and some microvascular complications have been observed. In children aged 2-18 years with T1DM, over 12 years a hospital based case series study found that the prevalence of retinopathy was 1.3% and the prevalence of nephropathy was 0.4%. Neuropathy was found in 2 patients (0.6%) and coronary heart disease was also

found in 2 patients (0.6%). Acute diabetic complications such as diabetic ketoacidosis and hypoglycaemia were found in 62% and 38.1% respectively. [128] At diagnosis of T1DM, 55% of children in Almadinah region presented with ketoacidosis.[129-130] In the Eastern region, more than three quarters (77%) of children with T1DM had ketoacidosis. [131] In another hospital based study in Riyadh, 110 children were diagnosed with diabetes and followed up for 5 years (1985-1989).[132-133] Consanguinity proportion among their parents was 42.7%, either being first or second cousins. Diabetic ketoacidosis was the most common seen clinical presentation (67%).

Most of the studies addressing the prevalence of diabetes complications in Saudi Arabia, however, suffered from the fact that they were mainly clinic or hospital based studies which might overestimate the prevalence of diabetes complications due to the selection bias inherent to this type of studies. Moreover, several studies used different inclusion and exclusion criteria that limit the generalizability and comparability of such studies. Despite these weaknesses, the studies are still useful as a measure of quality of diabetes care. The studies identified substantial inadequacies in healthcare which need to be addressed.

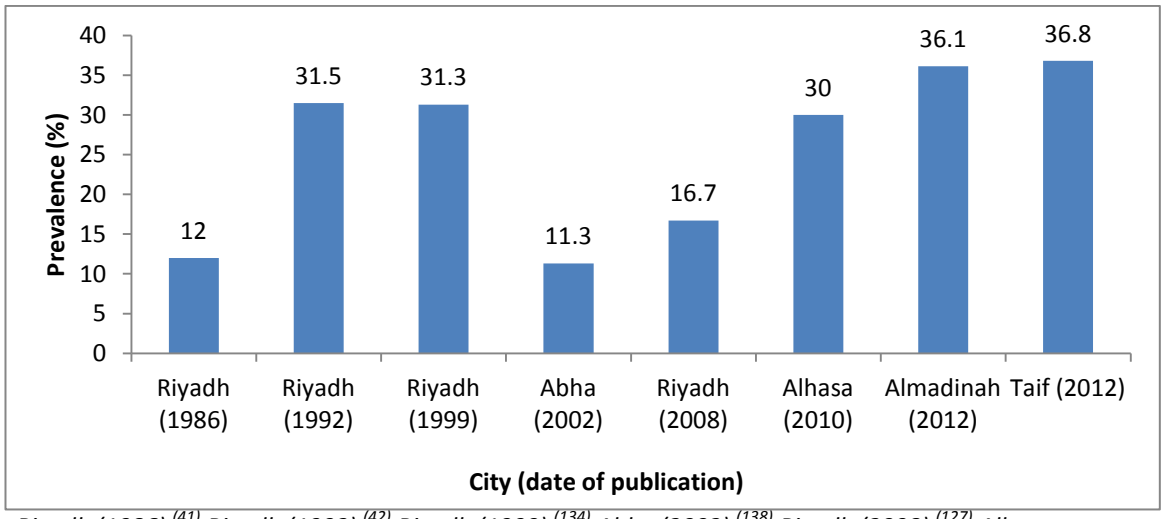
***Diabetic retinopathy:***

At a diabetes centre in Riyadh, Abu Elasrar et al reported a prevalence of retinopathy of 31.3% with higher prevalence among patients with T1DM (42.5%) than those with T2DM (25.3%). Advanced age (> 60 years), long duration of diabetes (> 10 years), poor glycemic control, hypertension, high cholesterol levels and presence of nephropathy were associated with retinopathy.[134] At the same diabetes centre in Riyadh but in

another study by the same authors, the presence of retinopathy significantly predicted the presence of neuropathy, nephropathy, and cerebrovascular disease in both T1DM and T2DM patients.[135] In Alhasa district, a primary healthcare centre based study reported a 30% prevalence of retinopathy.[136] A hospital based study in Almadinah reported a higher prevalence of 36.1%.[137] However in Abha city, a single primary healthcare centre study reported a lower prevalence of 11.3%.[138] A recent published, population-based study in Taif district, which screened people aged ≥ 50 years for diabetes and diabetic retinopathy showed a prevalence of 29.7% for diabetes and of whom 36.8% had retinopathy.[139] A summary of the reported prevalence of diabetic retinopathy in Saudi Arabia are shown in figure 7. However, the variation among these studies in the reported prevalence needs to be interpreted with caution because they covered a period of more than 25 years, they were conducted in different geographical regions and settings and used different methods of recruitment and diagnosis.

Similar studies in neighbouring countries (Oman and United Arab Emirates), however, reported a lower prevalence of retinopathy (14.4% and 19%).[140-141] Conversely, other neighbouring countries reported higher prevalence, i.e. Egypt (42%)[142] and Jordan (64%).[143] These substantial differences in the reported prevalence of retinopathy could be due to the differences in the age distribution of different populations, study methodology, screening methods or places of recruiting participants.

**Figure 7: Prevalence of diabetic retinopathy in Saudi Arabia, 1986 - 2012**




*Riyadh (1986),[41] Riyadh (1992),[42] Riyadh (1999),[134] Abha (2002),[138] Riyadh (2008),[127] Alhasa (2010),[136] Almadinah (2012),[137] Taif (2012).[139]*

### *Diabetic Nephropathy:*

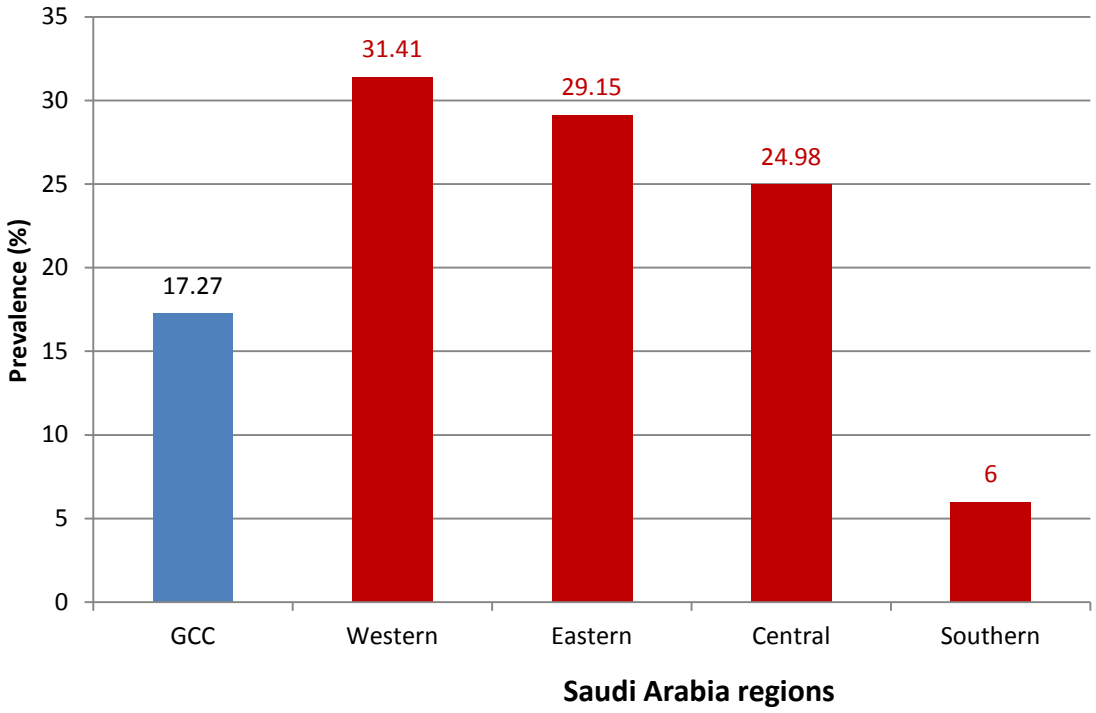
Among the countries of the GCC, which consists of Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman, diabetes was the primary leading cause of end–stage renal disease (ESRD).[144] In patients with T2DM attending a diabetes clinic in Riyadh, Alzaid et al estimated the prevalence of microalbuminuria (30 - 300 mg/24 h) to be 41.3% and clinical proteinuria (dipstick-positive) to be 12.7%. In contrast, a similar study by Huraib et al found that the prevalence of microalbuminuria (<300 mg/24 h + urinary albumin to urinary creatinine ratio (UACR) > 3.5) was 16.8% and the prevalence of clinical proteinuria (> 300 - < 3000 mg/24 h) was 30.4%. Hypertension and duration of diabetes were found to be correlated with the development of diabetic nephropathy. In two regions of Saudi Arabia (Almadinah and Gizan), diabetic nephropathy was the commonest cause (30.4%) of ESRD.[121] In Almadinah, diabetic nephropathy has been reported to be the commonest cause of

ESRD (45.2%) while it was seen in only 12% of the cases of ESRD in Gizan region.[121] After 12 years, a study in Almadinah region showed a similar finding for diabetes to be the major cause of ESRD (42.5%).[123] In the southern region of Saudi Arabia, a diabetes clinic based study in a primary healthcare centre in Abha city found that more than half (54.3%) of patients with T2DM who visited the clinic at least once during the last 12 months had dipstick positive proteinuria.[145]

In Saudi patients with T2DM, several studies showed that diabetic nephropathy tends to be progressive with a rapid course.[122, 146-149] For example, one of the studies found that 66.8% of patients with diabetic nephropathy doubled their serum creatinine in 3.59 ± 2.88 years.[147] Another study reported a lower prevalence of 39.9% over a mean duration of 9.98 ± 6.04 years of diabetes. At the end of the study, 15.2% of patients with diabetic nephropathy developed ESRD and 12.6% required dialysis.[148]

In summary, a recent meta-analysis of 21 studies showed that the prevalence of diabetic nephropathy as a cause of ESRD in all the GCC countries is 17.27% (95% CIs, 11.38–26.21%).[144] In Saudi Arabia, the summarized prevalence estimate of diabetic nephropathy is 31.41% (95% CIs, 7.39–133.59%) in the western region, 29.15% (95% CIs, 9.21–92.24%) in the eastern region, and 24.98% (95% CIs, 7.01–88.98%) in the central region, compared to 6% (95% CIs, 2–17.8) in the southern region (Figure 8). [144] Data on diabetic nephropathy among patients with T1DM is rare. In patients with T2DM, diabetic nephropathy is progressive over time.

**Figure 8: Summarized estimate of diabetic nephropathy prevalence (%) as a cause of ESRD in the GCC countries and different regions of Saudi Arabia.** [144]




### *Diabetic Neuropathy and foot diseases:*

In 1991, Sulimani et al retrospectively reviewed the case notes of 1010 patients with diabetes at a University hospital in Riyadh.[150] The study revealed an overall prevalence of 10.4% for diabetic foot lesions. Of these, 88 patients were further described and 48.8% of them suffered from diabetic peripheral neuropathy, 54.5% had peripheral vascular disease, and 34.1% had suffered some type of amputation.[150]

In 1998, a case series study in a private hospital in Riyadh, examined the presence of neuropathy, foot ulcers and amputations among 375 Saudi patients with T2DM.[151] The prevalence of neuropathy was 20%, foot ulcers 2.4% and amputations below the

ankle 1.3%. Among those patients who had diabetes for 10 years or more, the prevalence of neuropathy, foot ulcers and amputations increased to 38%, 4.7%, and 3.4% respectively.[151] Moreover, the author compared a group of Swedish patients with diabetes with similar age and sex matched Saudi patients. The prevalence of diabetic neuropathy was similar in both groups; however, the prevalence of foot ulcers and amputation was lower in the Saudi patients.[151]

At King Abdulaziz University hospital in Jeddah, a total of 237 patients with a mean age of 54 years and mean duration of diabetes of 10.6 years were studied.[152] The prevalence of diabetic neuropathy was 82%, of whom 57% of patients were asymptomatic. This high prevalence of diabetic neuropathy is one of the highest in the world. This could be attributed to the involvement of high proportion of patients with T2DM (84%), with poor glycemic control (59.5%) and 10 years mean duration of diabetes. Old age, smoking, poor glycemic control and long duration of diabetes were related to the symptomatic diabetic neuropathy.[152] Another study at the same hospital reviewed a small sample of 34 case notes of those patients with diabetes who were admitted with diabetic foot.[153] Peripheral neuropathy was the major participating factor in 94%. Half (50%) of the patients had peripheral vascular disease. More than half of the patients (59%) presented mainly with foot ulcers and 8 patients (23.5%) underwent foot amputations.[153]

Data on the prevalence and incidence of neuroarthropathy in patients with diabetes in Saudi Arabia is scarce. Only one study at King Khalid hospital in Najran has been found in the literature. This study reported that among 296 patients with long standing and poorly controlled diabetes, 37 (12.5%) had diabetic neuropathy and 11 (30%) of them

had bone and joint lesions. The overall prevalence of neuroarthropathy was 4% and 18% of them ended up with amputation.[154]

At King Fahd hospital in Almadinah, 263 patients with diabetes attended the hospital diabetes centre between 2008 and 2009; with diabetes mean duration of 13.89 ± 8.7 years and 85% of them had T2DM.[155] The prevalence of both symptomatic and asymptomatic diabetic neuropathy was 79%. Old age, poor glycemic control, long duration of diabetes and hyperlipidemia were reported as risk factors for neuropathy.[155]

The overall prevalence of painful diabetic peripheral neuropathy among 1039 adult patients from 100 outpatient clinics across Saudi Arabia was found to be 65.3%.[156] Burning sensation, tingling and numbness were the most common symptoms.[157] This prevalence was higher than a recent reported prevalence in the Middle East region (53.7%) [158]and far higher than the worldwide prevalence estimate of 15%. [159]

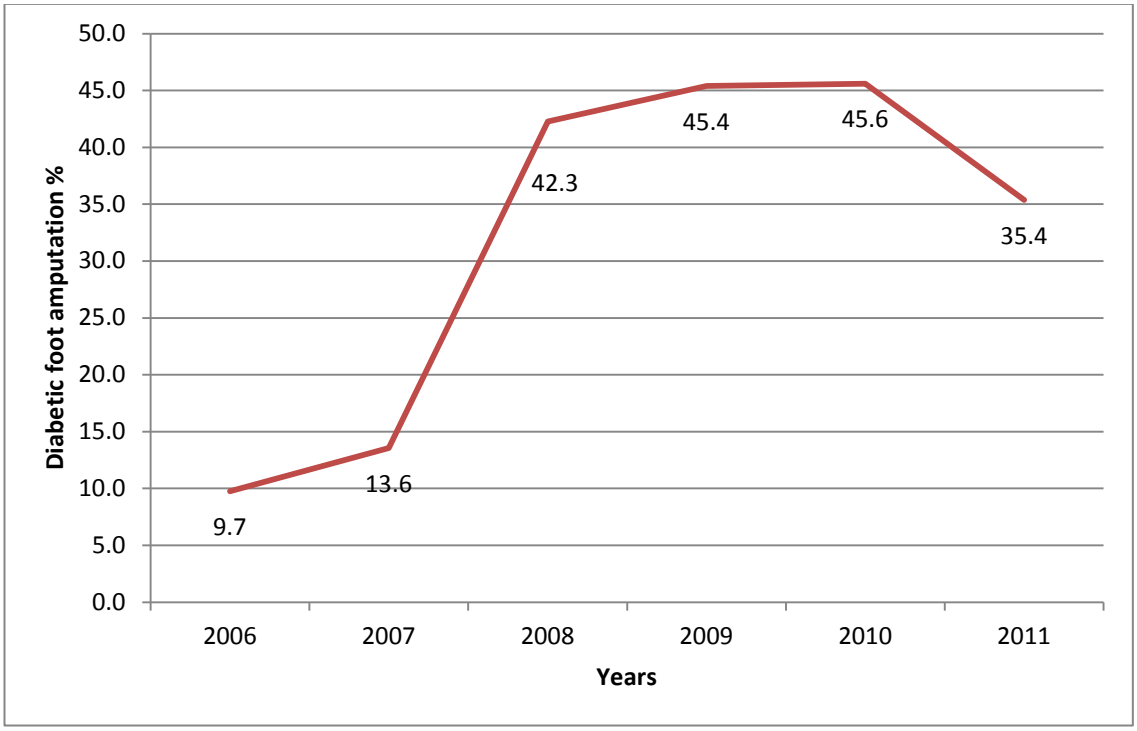
A hospital based, case control study in Riyadh reported that duration of diabetes, presence of diabetic neuropathy and level of erythrocyte sedimentation rate (ESR) were independent predictors for diabetic foot after adjusting for both age and sex confounding effects. In addition, the study estimated the duration of 11 years of diabetes as the most valid cut-off point for the prediction of diabetic foot.

A multicentre retrospective study in Jeddah found that among 275 patients with a mean age of 58.5 ± 11.6 years, and had diabetic foot disorders, 81.8% presented with foot ulcers and 48.8% underwent amputation.[160] In the eastern part of Saudi Arabia, a prospective study at ARAMCO Medical Services Organization assessed the clinical

presentation and management outcomes of type 2 diabetes patients with diabetic foot ulcers. The mean age of 62 included patients was 64.8 ± 12 years. Over 12 months (2003-2004), 19% of patients with foot ulcers had suffered some type of amputation.[161]

The MOH data showed an increased trend of diabetic foot amputations. Among all those patients who had suffered some type of amputation and referred to the medical rehabilitation centres for follow up, 35.4% were due to gangrene of diabetes mellitus in 2011 (Figure 9).[162] The rapid rise between 2007 and 2008 is difficult to explain. This increase is unlikely to be real rise in the frequency of amputations due to diabetes. It might be due to different systems of detecting and recording complications.

**Figure 9: Proportions of amputation due to diabetes in MOH, Saudi Arabia, 2006 - 2011**



In comparison with the other parts of the world, a cross sectional survey in the United Kingdom (UK) found that 5.3% of patients with T2DM and 7.4% of those with either T1DM or T2DM had suffered from foot ulcers.[163] In Sweden, 5.4% of T2DM patients had foot ulcers and the annual incidence was 3.6%. The reported prevalence of amputation was 1.29%. [164] At the global level, a pronounced variation exists in the incidence of lower extremity amputation, ranging from 46.1 to 9600 per 100,000 people with diabetes.[165]

### 1.3.4. *Diabetes burden and costs*

***Mortality:***

Diabetes Mellitus is one of the most challenging epidemic health problems in Saudi Arabia. However, data on its mortality and costs in Saudi Arabia is very scarce. Therefore WHO and IDF used modelling approaches to provide more realistic estimates of diabetes mortality in Saudi Arabia. According to the latest WHO report on non-communicable diseases, 71% of all deaths in Saudi Arabia were attributed to non-communicable diseases. Diabetes alone was estimated to account for 6% of all deaths in all ages in Saudi Arabia.[166] In 2012, the IDF estimated that the number of deaths due to diabetes in Saudi Arabia was 20,933.[167] The age adjusted death rate was estimated to be 58.97 per 100,000 of population which ranks Saudi Arabia number 38 in the world.[168]

***Morbidity:***

At the medical unit of King Abdulaziz University Hospital in Jeddah, 17% of hospital admissions over 4 years (1996 to 1999) were due to diabetes.[169] Macrovascular complications (38%) and hyperglycaemia (21%) were the most common causes of diabetes admission. The mean duration of hospital stay was 25.4 days and the mortality rate was 13%.[169] A retrospective case control study at a teaching hospital in Saudi Arabia showed that hospital admission for T2DM patients was associated with male gender, presence of nephropathy and HbA1c ≥ 7%. [170]

At King Khalid University Hospital in Riyadh, 2.6% of all hospital admissions over six years (1986 to 1991) were related to diabetes.[171] All hospital related diabetes

admissions occupied 3.5% of all hospitalization days and lasted longer than the average hospital admission. Diabetes mellitus was the primary diagnosis in 39%, secondary to other diseases in 47% and related to diabetes in pregnancy in 14%. Among those patients who were admitted primarily because of diabetes or its complications, the majority of admissions (89.4%) were for either initiation of diabetes therapy or management of its chronic complications. The remaining proportion (10.6%) was admitted because of acute metabolic complications such as ketoacidosis or non-ketotic hyper-osmolar states.[171]

Analysis of MOH data between 2006 and 2011 revealed that diabetes mellitus was the third most common cause of visiting the primary healthcare centres (mean 6%). Of those patients, 45.71% were aged between 45 to 60 years and 24.26% were above 60 years of age.[162] In 2011, diabetes mellitus was the cause of 3.79% of patient visits to the outpatient clinics of the MOH hospitals. This proportion ranged from 1.63% in Jeddah district to 6.73% in Makkah district (Figure 10). This variation between MOH districts could be real or it could be due to differences in recording practices. Visits of patients with diabetes to the diabetes clinics at MOH hospitals has increased year on year over the past 6 years (Figure 11). The percent of diabetes emergency cases to all emergency cases in the MOH hospitals increased with time from 2.37% in 2006 to 3.24% in 2011 (Figure 12).

**Figure 10: Proportion of the visits to the outpatient clinics of MOH hospitals that were due to diabetes, Saudi Arabia, 2011**

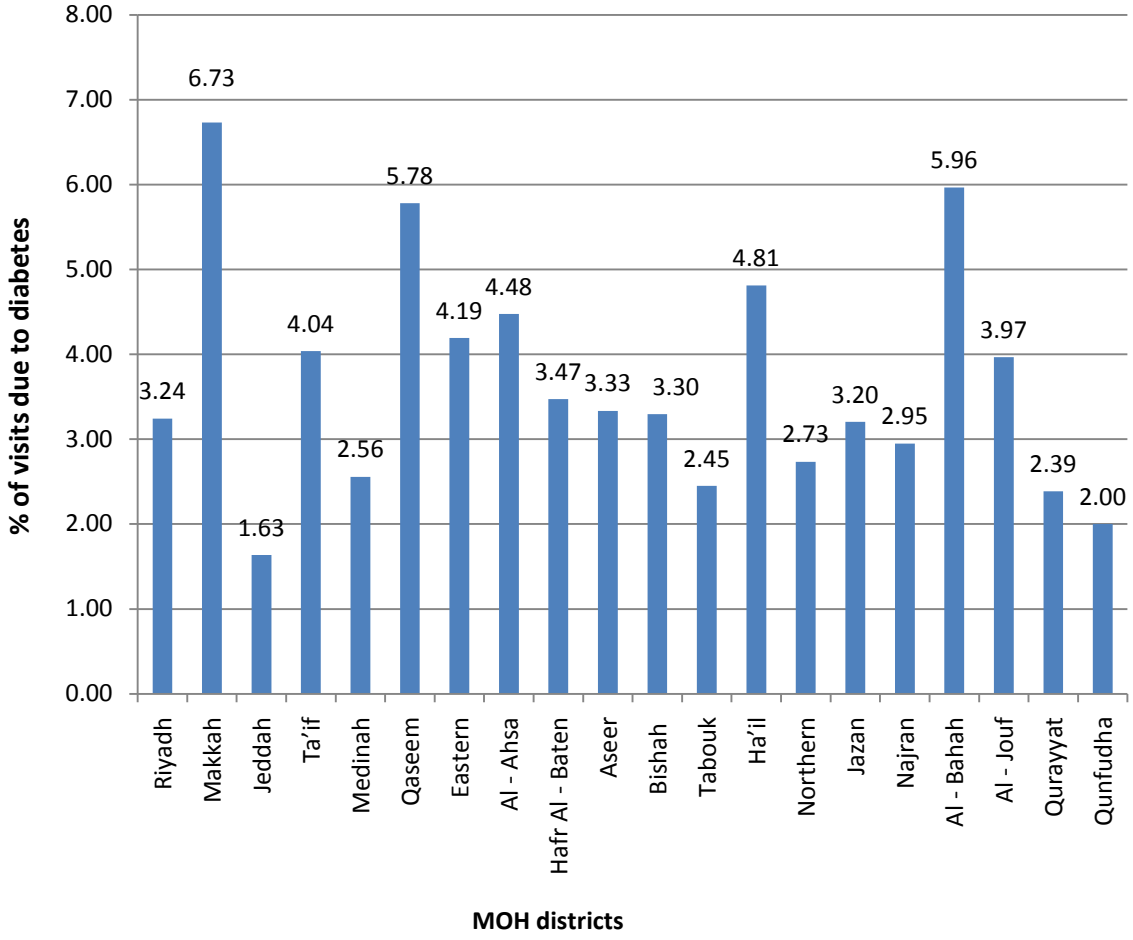


**Figure 11: Number of visits of patients with diabetes to the diabetes clinics at MOH hospitals, Saudi Arabia, 2006-2011**

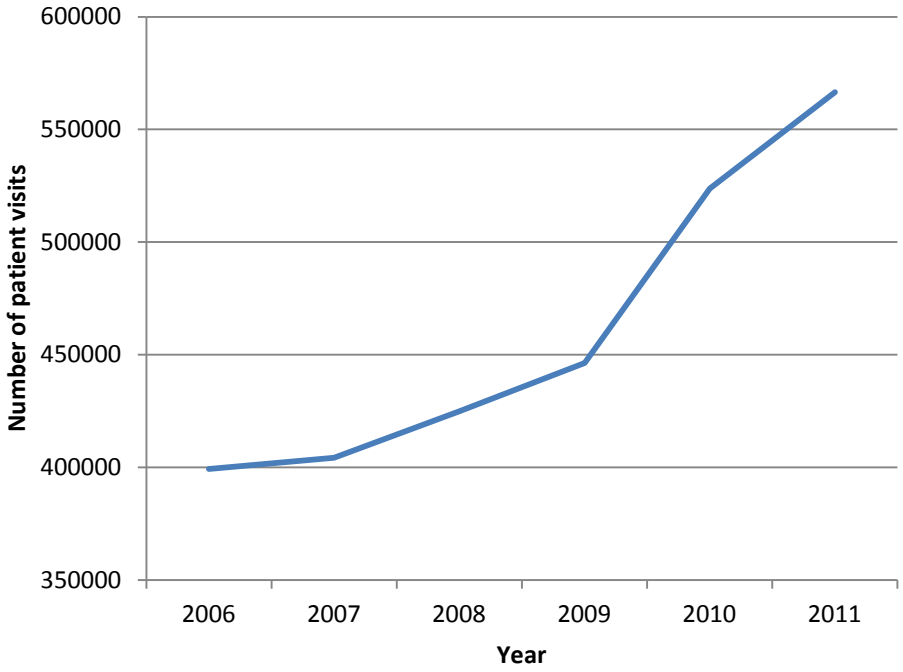
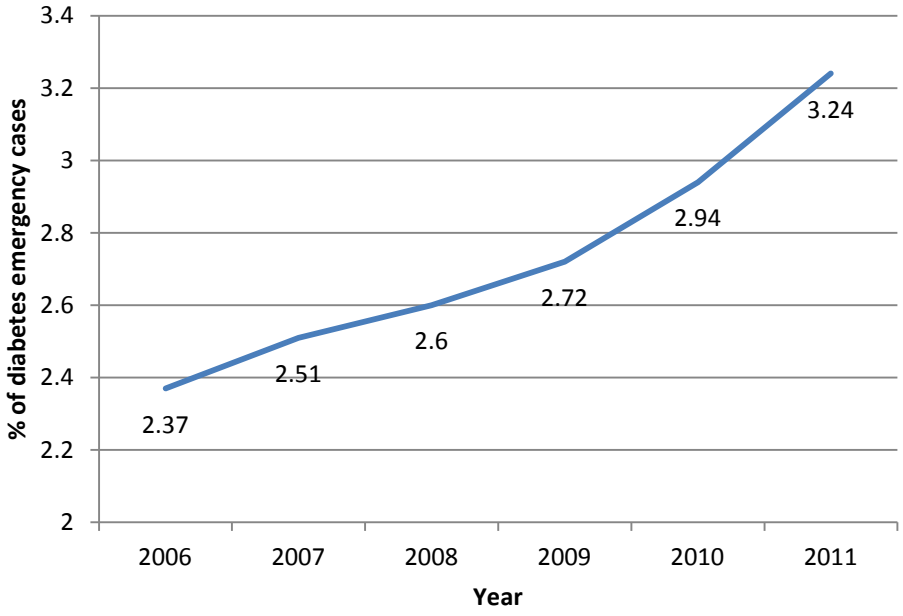



**Figure 12: Proportions of diabetes related emergency cases in the MOH hospitals, Saudi Arabia, 2006-2011**



***Costs:***

Globally, in 2011, the estimated mean of healthcare expenditure per person with diabetes was 1,274 US$. In Saudi Arabia, the corresponding figure was 998 US$.[37] Furthermore, 1.4 billion US$ was spent on treating and managing diabetes in 2010 in Saudi Arabia which represent 21% of the national healthcare expenditure.[36, 172] This proportion of spending on diabetes is the second highest in the world and it is expected to rise to 3 billion US$ by 2030.[36, 172]

Improved glycemic control in T2DM patients in Saudi Arabia by a 1% reduction in HbA1c was associated with reduction of diabetes direct costs by 4,289 US$, improved life expectancy by 0.71 years and increased time free from diabetes complications.[173] These clinical and economic benefits were driven by the reduced incidence of diabetes complications,[173] which carry a substantial financial burden on healthcare expenditure in Saudi Arabia.[174] Diabetic nephropathy was observed to cause the highest annual costs, (renal transplantation 62,571 US$; and haemodialysis 40,000 US$).[174] Cardiovascular complications such as myocardial infarction, stroke, heart failure and peripheral vascular diseases were also associated with high annual costs.[174]

## 1.4. Rationale for the study

This background shows that diabetes mellitus prevalence is rising and has become an epidemic disease in Saudi Arabia. One in five of Saudi Arabians beyond the age of 30 has diabetes mellitus.[32, 66, 83] This dramatic increase in the prevalence of diabetes occurred alongside rapid economic development, progressive urbanization, ageing populations, adoption of sedentary lifestyle, poor dietary habits and increased obesity.[32, 99, 175] However, this rise is not expected to stop in the coming decades. The prevalence of T2DM among the Saudi population aged ≥ 25 years is estimated to continue rising from 31.4% in 2013 to 44% in 2022 if the prevalence of obesity and smoking continues to increase.

Moreover, most of the reviewed studies showed consistently that more than half of patients with diabetes did not attain the recommended target of glycemic control. Poor patient compliance and ineffective diabetes care accompanied the poor diabetes control.[42, 104-105, 176-181] In addition, diabetes complications were common among hospital patients. However, most of the studies addressing the prevalence of diabetes complications were hospital based studies which might overestimate the prevalence of diabetes complications due to the selection bias inherent to this type of studies.

As a result, this high prevalence of diabetes and its management has posed a substantial financial burden on the national healthcare budget. In 2010, 1.4 billion US$ was spent on diabetes management in Saudi Arabia which represents 21% of the national healthcare expenditure and is expected to rise to 3 billion US$ by 2030.[174] Therefore, diabetes mellitus is a major contributor to the morbidity and mortality; carries a huge socioeconomic burden in Saudi Arabia.

However, the health care system is generally not yet ready to deal with such an increasingly worrisome health problem. Public health planners and decision makers in Saudi Arabia need to be more aware of the current high burden posed by diabetes and its complications and, crucially, prepare for its most likely increase during the coming decades.

Management of diabetes therefore needs to be improved. Optimal diabetes management is an important requirement. Implementing effective interventions to prevent diabetes, promote health and improve the quality of diabetes care are essential. The Saudi Arabian government responded to this rising prevalence of diabetes by implementing a national programme for diabetes mini-clinics at the level of primary care and established more than 20 specialist diabetes centres across the county. However, there is limited information on both the extent of implementation and efficacy of these diabetes management programmes.[182] Therefore, it is important to assess the quality of these diabetes care programmes at both the national and local levels. In addition, it is also important to investigate in depth the problem of diabetes to know first how this disease is managed and what care services are currently delivered. Second, in order to develop effective interventions to improve the quality of care, the specific deficiencies in diabetes care should be identified, the gaps in service provision should be explored and the needs of people with diabetes should be assessed. Moreover, barriers to optimal care and quality improvement should be addressed to facilitate care improvements and meet what patients and carers need.

Research is crucial to inform the development and implementation of any intervention to improve healthcare. The National Medical and Health Research Strategy for the Kingdom of Saudi Arabia identified diabetes as a national health priority area for research and strategic intervention.[34] In Saudi Arabia, research on assessment of healthcare needs of people with diabetes, how diabetes care should be delivered, what are the potential areas for service improvement, and what are the barriers to improve diabetes care are very scarce. Moreover, research on developing effective behavioural change interventions to promote diet, physical activity and adherence to medications and follow-up appointments is needed. Therefore, the aims of this thesis were to fill these knowledge gaps by analysis of routine healthcare data, patient case notes and exploring the knowledge and experience of both the users and the providers of diabetes care.

# CHAPTER TWO

# Research aims and objectives

*This chapter outlines the research aims and objectives.*

# Chapter 2: Research aims and objectives

## 2.1. Aims

The long term aim of this research project is to lead to improvements in detection, diagnosis, management and outcomes of diabetes in Saudi Arabia. The short term aims are first, to support the Saudi Ministry of Health by providing a robust assessment of the quality of diabetes care in Saudi Arabia; and secondly by identifying the potential areas of diabetes care that need to be improved. The domain of issues is broad, including how this disease is currently managed, identifying structural deficiencies and gaps in diabetes service provision, evaluating process and outcome measures of quality of diabetes care, assessing perceived healthcare needs of people with diabetes and identifying areas of priority for service improvement.

Abha city in the southern region of Saudi Arabia was selected as the study area for this research project.

## 2.2. Objectives

The primary objectives of the study were to:

1. Evaluate whether the diabetes services are structured and resourced in such a way as to allow quality care to be delivered. This requires an assessment of the

services and resources that are available for diabetes care, comparing these against national standards.

2. Estimate the registered prevalence of diabetes, its complications and pattern of service utilization by identifying, collecting and analyzing available routine data about diabetes care for the preceding 12 months.
3. Carry out an extensive review of the case notes of patients with diabetes to:
    a. Describe their demographic, clinical and behavioural characteristics,
    b. Assess to what extent healthcare providers implemented the key process measures of diabetes care,
    c. Assess to what extent the outcome targets of diabetes care were achieved.
4. Conduct interviews with people with diabetes and key professionals to explore their views and priority perception to determine:
    a. What are the unmet healthcare needs of people with diabetes,
    b. What are the unavailable diabetes services,
    c. How the current diabetes services could improve and
    d. What the barriers are to service improvement.
5. Explore the views of healthcare leaders on the priorities for improving diabetes care to meet the identified needs and close gaps in service provision.
6. Produce evidence that can be used by healthcare leaders and decision makers to help in improving the organization and delivery of diabetes care in Saudi Arabia.

# CHAPTER THREE

# Outline of the thesis

*This chapter outlines the chapters of this thesis.*

# Chapter 3: Outline of the thesis

**Chapter 4** provides brief background information about the study area and settings. The chapter discusses the study theoretical framework and why a combination of different methods was used. It then describes the objectives, advantages, disadvantages and source of data for each research method used. It presents the research flow and organization as well as the project setup and research team development.

**Chapter 5** reviews the structure and organization of the current healthcare system and diabetes care in Saudi Arabia. It gives an overview about diabetes care services in Abha city and presents the results of evaluating in depth the current available diabetes services and resources in Abha city against national standards. Several gaps in service provision are discussed.

**Chapter 6** discusses the methods and results of the case note review. Demographic and clinical characteristics of people with diabetes in Abha city are presented. In addition, the process and outcome measures of diabetes care are discussed.

**Chapter 7** explores the view and perceptions of key informants including patients, physicians, nurses, managers and pharmacists on their experience with the current diabetes care and their priority needs. Conclusions are drawn regarding identified needs and areas for service improvement.

**Chapter 8** reports the results of a survey with healthcare leaders to explore their perceived priorities for a number of recommendations to improve diabetes care in Abha city. The principal findings and limitations of the survey are discussed.

**Chapter 9** discusses the key findings of the whole research project and the implications of these findings for service improvement. Recommendations are made for future developments in diabetes care. Major priorities for research are identified.

# CHAPTER FOUR

# Research methods and project setup

*This chapter provides brief background information about the study area and settings. The chapter discusses the study theoretical framework and why a combination of different methods was used. It then describes the objectives, advantages, disadvantages and source of data for each research method used. It presents the research flow and organization as well as the project setup and research team development.*

# Chapter 4: Research methods and project setup

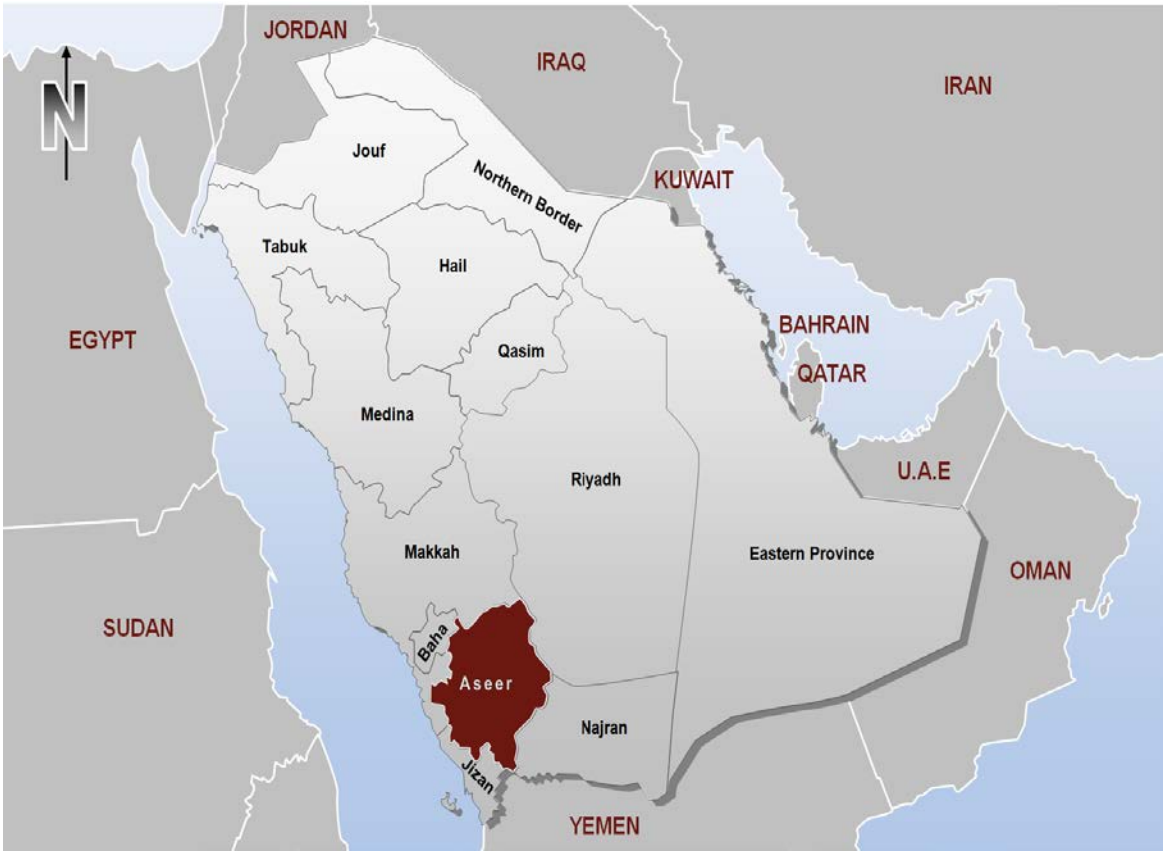
## 4.1. Introduction

The aim of this chapter is to give an overview for the study area and settings, the theoretical framework for assessing diabetes care and the main research methods used in this thesis. It also aims to make the research strategies and approaches more explicit and to describe the foundation on which the thesis overall analytical frame is based. In addition, this chapter will discuss why a combination of different methods was used and what were the limitations and advantages of each method. Finally, this chapter will discuss some difficulties and challenges involved in the actual research process including team development and data collection and digitalization.

## 4.2. Study area and Settings

The Kingdom of Saudi Arabia is divided into 13 provinces with 13 capitals (Map 2) and an estimated population of 28 million, of which almost one third (31%) is foreign expatriates.[183]

**Map 2: Provinces of Saudi Arabia with Aseer province highlighted**

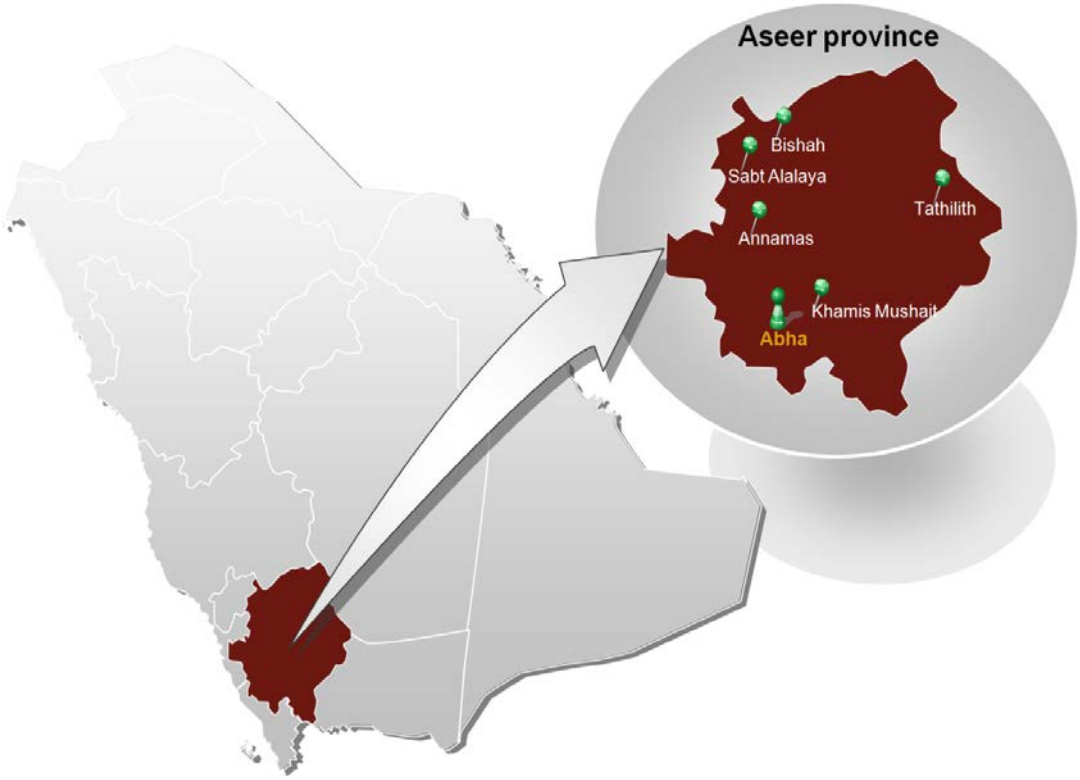



Apart from Aseer and Baha provinces, the climate is generally a desert climate with an average summer temperature of 45°C and winter temperature of 10 °C. In the autumn and spring, the mean temperature is around 29°C. The Aseer and Baha provinces are influenced by the Indian Ocean monsoons, which usually occur between October and March, causing mild climate and rainfall during this period.[184]

The study was conducted in Abha city in Aseer province which is located in the southwest of the country (Map 3). Aseer region covers 81,000 square kilometres and has an estimated population of 1,913,392.[183] Aseer is a mountainous region and contains the country's highest peak which is near Abha city (Jabal Alsoodah). Abha city is the capital city of Aseer province. It is located in the southern part of the province (Map 3) and contains the main governmental facilities such as banks, hospitals,

Universities and Ministries' branches. It is a typical city similar to many other cities in the country in terms of population size, demography and availability of healthcare services and public facilities.

### Map 3: Aseer province and Abha city




The national census of 2010 revealed that 7% of the total population was living in Aseer region.[185] Abha city was one of 19 cities where the population has exceeded 100,000 people.[185] According to the national primary healthcare registry, the resident population of Abha city is currently 126,767.[186] Abha city has similar demographic characteristics to the whole country. For example, the ratio of men to women in Abha city is similar to the national ratio where there are 63,658 males (50.2%) and 63,109 females (49.8%). Abha city is also similar to the whole country in having high ratio of

young population. The percentage of the young population (< 45 years old) is almost 85%.[186]

The primary healthcare services in Abha city are provided by 10 primary health care centres (PHCCs). Each PHCC provides primary healthcare services to specific catchment area. The secondary healthcare services are provided by one general hospital and one larger central hospital. There is also one specialist diabetes centre which provides both primary and secondary care as well as specialist diabetes care. All these were included in the study. Map 4 shows Abha city and the sites of the PHCCs, hospitals and the diabetes centre in the city.

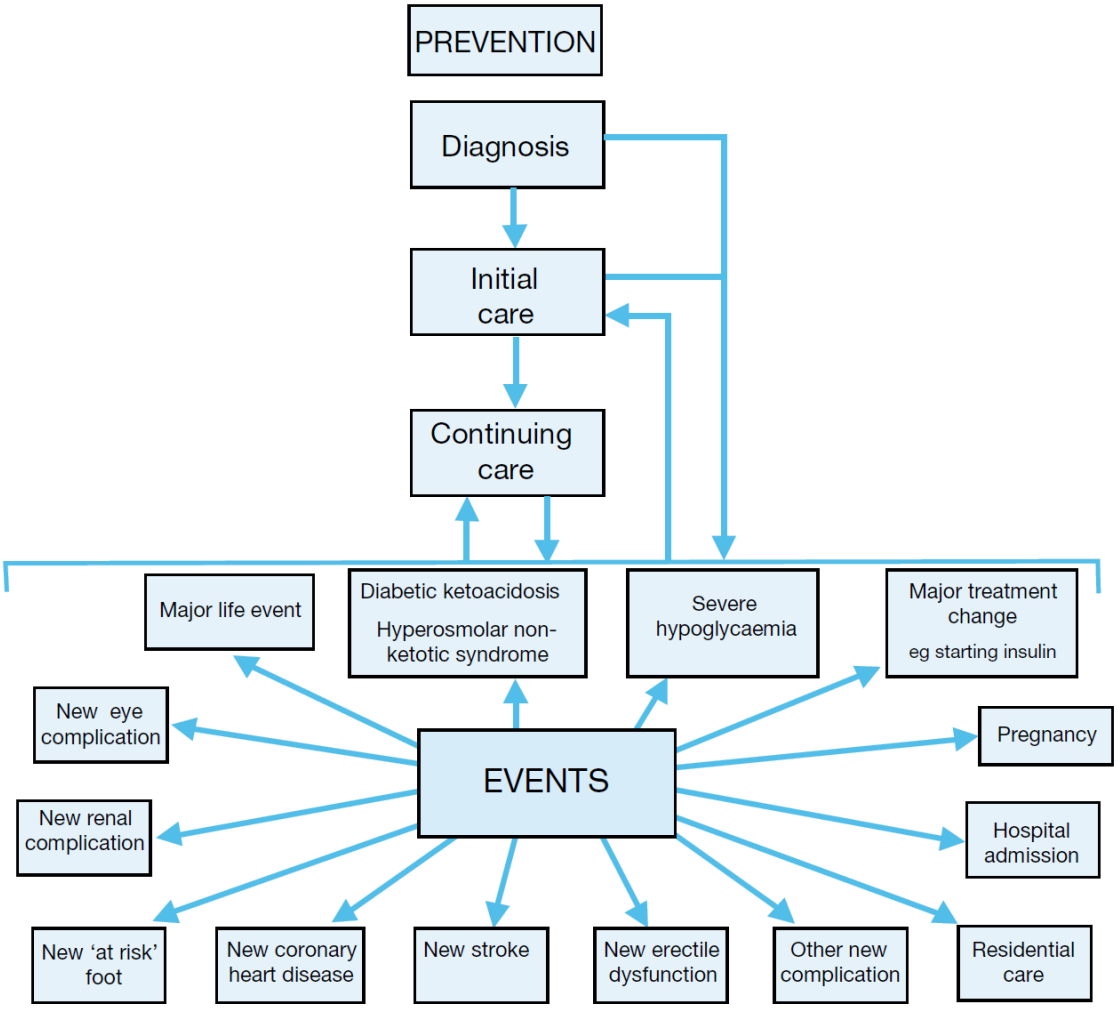
## Map 4: Map of Abha city showing the sites of the PHCCs, hospitals and diabetes centre


*Source: Google maps using CartoDB online service, http://cartodb.com/*

## 4.3. Theoretical framework and research methodology

Diabetes care is inherently complex and involves different professions and different aspects of care at different healthcare levels. Patients with diabetes are likely to need a wide variety of healthcare services during their lifetime with this disease, particularly if someone develops it in an early life. The English National Service Framework for diabetes summarized concisely but comprehensively the lifetime trajectory of an episode of diabetes in the figure below (Figure 13).[187]

**Figure 13: Summary of the lifetime trajectory of an episode of diabetes**



The resultant multiplicity and diversity of services that have to be navigated by a person with diabetes makes it difficult to comprehensively assess all the components of diabetes care. In addition, globally, there is large diversity in diabetes care programmes and related quality indicators.[188]

Further, it is not simple to assess the quality of care. As Avedis Donabedian, the acknowledged guru of medical audit and quality of care, said:

'There was a time, not too long ago, when this question could not have been asked. The quality of care was considered to be something of a mystery: real, capable of being perceived and appreciated, but not subject to measurement. The very attempt to define and measure quality seemed, then, to denature and belittle it'.[189] However, times have changed. The issue of quality of care is now paramount and as Donabedian said: 'Now, we may have moved too far in the opposite direction'.[189]

Although quality of care is often perceived as difficult to define, the Institute of Medicine in the United States has proposed the following widely accepted definition: "The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge".[190] Donabedian constantly stresses that the quality of a service is defined as "the degree to which it conforms to pre-set standards of care".[191] While many definitions for the quality of care have been offered, this practical and simple definition was adopted for the purposes of this study. This definition makes the

subjective nature of quality more explicit by measuring the quality of care against pre-set standards.

The quality of care is multidimensional and its assessment requires deconstructing it into its core dimensions.[192-193] A formal framework for evaluating the quality of care was suggested by Maxwell who described six dimensions to quality in healthcare.[192, 194] These dimensions and its definitions are summarized in table 4.

**Table 4: Maxwell's dimensions of quality**

| Dimension | Definition |
|---|---|
| **Effectiveness** | Is the treatment given the best available in a technical sense, according to those best equipped to judge? What is their evidence? What is the overall result of the treatment? |
| **Acceptability** | How humanely and considerately is this treatment/service delivered? What does the patient think of it? What would/does an observant third party think of it ("How would I feel if it were my nearest and dearest?") What is the setting like? Are privacy and confidentiality safeguarded? |
| **Efficiency** | Is the output maximised for a given input or (conversely) is the input minimised for a given level of output? How does the unit cost compare with the unit cost elsewhere for the same treatment/service? |
| **Accessibility** | Can people get this treatment/service when they need it? Are there any identifiable barriers to service (e.g. distance, inability to pay, waiting lists, and waiting times) or straightforward breakdowns in supply? |
| **Equity** | Is this patient or group of patients being fairly treated relative to others? Are there any identifiable failings in equity e.g. are some people being dealt with less favourably or less appropriately in their own eyes than others? |
| **Relevance** | Is the overall pattern and balance of services the best that could be achieved, taking account of the needs and wants of the population as a whole? |

*Source: adapted from Maxwell 1992.*[192]

As long ago as 1966, Donabedian suggested that the quality of care of patients could be assessed in three dimensions: structure, process and outcome.[195] Structure refers to the availability of suitable buildings, equipment, facilities and adequately trained staff. Campbell et al identified two domains of structure: physical characteristics and

staff characteristics.[196] The first domain would include both the resources and how these resources are organised. For example, the availability of podiatry services in terms of personnel and equipment and how these services are organised (e.g. the existence of a booking system for appointments) are both structural elements of diabetes care. The second domain would include for example level of training and experience of the staff involved in delivering healthcare.

Processes of care refer to the activities of healthcare and involve the interactions between users and the healthcare structure. In essence, care processes are all that is done to or with patients and characterize what care is actually delivered. For example, screening for retinopathy is a care process that can be measured by looking at what proportion of patients with diabetes had retinal screening for the preceding 12 months.

Outcome refers to the change in the patient's current or future health status that can be attributed to the antecedent care.[197] Outcomes are consequences of care and may be influenced either directly or indirectly by the structures and processes of care.[196] Availability of good structure increases the likelihood of good process, and good process increases the likelihood of good outcome.[189] In addition, structural capabilities might directly influence physician practice pattern.[198]

Although it is necessary to distinguish between structure of healthcare, actual care delivered (processes) and the consequences of this care (outcomes) when they are assessed as measures of quality of healthcare, none of them is necessarily the best measure of quality. The main disadvantage of assessing the structure measures is that

the relationship between structure and process and/or structure and outcome are complex and developing evidence for such associations is difficult.[198]

Assessing the quality of foot care for people with diabetes can be done by measuring how many foot clinics and podiatrists were available (structure). Alternatively, it can be measured by the number of patients with diabetes who were seen in foot clinics or the proportion of all patients who have had foot examination (process). Another option is to measure the quality of foot care by comparing the amputation rates (outcome). Each dimension has its own limitations in measuring the quality of care. For example, assessing the quality of foot care by the number of available foot clinics or podiatrists does not guarantee that the patients received care. In a similar manner, using the proportion of patients who have had foot examination does not mean that they had received the right management. Also, measuring quality through the outcomes is limited by many confounding factors that could explain the variation in outcome among practices.

In addition, the outcomes do not directly assess the quality of the processes and structures of care.[199] This is because the relationship between the process and outcome might be modified by many factors, other than healthcare, that are integrated into the end result. These factors can be for instance related to patient health awareness, adherence to therapy prescribed or the socioeconomic status.

This thesis has adopted Donabedian's model as the theoretical framework for assessing diabetes care in the city of Abha in Saudi Arabia. This model was chosen because it is simple, explicit and comprehensive in defining the dimensions of the quality of care. Under these headings of structure, process and outcome, a wide range

of measures can be developed and assessed. Moreover, for each of the Maxwell's dimensions of quality, measures of quality can be derived based on assessment of system structure, processes or outcomes of care.[199] In addition, Donabedian's model is suitable for assessing diabetes care because the local diabetes care guidelines and quality assurance manuals have used the same dimensions in setting the standards of diabetes care.[200-202]

In this study, all the three dimensions (structure, process and outcomes) were considered to assess diabetes care. By reviewing several diabetes management guidelines[8, 15, 81, 203-206] and several authoritative reports on diabetes care organization and assessment in Scotland,[207-213] a list of quality measures for each dimension were chosen to be assessed. However, after reviewing the current Saudi guidelines on diabetes care,[200-202, 214-216] the case notes of patients with diabetes and identifying which data are locally available, this list of quality measures was shortened. For example, measures such as length of waiting for appointment, numbers of patients on waiting lists for care and local mortality rate due to diabetes were not measured due to lack of data.

Many experts in assessing the quality of care identified patient views and satisfaction as an important dimension of the outcome of healthcare. For example, Crombie said: "patient satisfaction is strictly a type of outcome measure, but because of its significance it merits a section to itself...Surveys of patient views can identify ways in which the service can be improved".[217] Donabedian also identified the importance of the patients' views on the delivery of care when he said: "quality cannot be judged by technical terms, by health care practitioners alone; that the preferences of individual

patients and society at large have to be taken into account as well".[193] Therefore, assessing the views and perceptions of patients towards diabetes care was one of the measures this study aimed to evaluate. However, because the perspectives of and approaches to quality of care would differ between patients, healthcare professionals, and managers, the views of all these three groups of stakeholders were considered.

The study overall aim is to assess diabetes care in Abha city by evaluating several measures for each quality dimension. This was planned to be done by evaluating the availability of care resources (structure), estimating the proportions of patients who received recommended interventions (process) and assessing how many patients achieved the recommended targets of diabetes care (outcome). In addition, the views and complaints of key stakeholders regarding diabetes care were also assessed as one of the measures of the outcome dimension.

To be able to assess the measures of each quality dimension as well as exploring perceptions of key stakeholders regarding diabetes care, several approaches and data collection methods were required. "The approach adopted and the methods of data collection selected will depend on the nature of the inquiry and the type of information required".[218] Therefore, a decision was taken to collect data from different sources using multiple research methods in order to achieve the research objectives and to assess as comprehensively as possible the diabetes care in Saudi Arabia.

The healthcare system in Abha city is a paper based system and there are no electronic systems or electronic databases available. Therefore, the data on diabetes care and patient management has to be extracted from either the routine healthcare reports or

from the patients' case notes using specific forms for data collection. This study uses multiple methods encompassing structured interviews, semi-structured interviews, standard checklist observation, routine data analysis and examination of patients' case notes. It was considered that including the views of key stakeholders would usefully supplement and extend the methods used in a triangulation approach. Combining these approaches is a good way of approaching research as it counteracts the weaknesses of any single approach.[219] Each one of these research methods will be described briefly here and in detail in the next chapters.

However, before that, it seems important to discuss in brief the multi-method approach that was used in this study and how it differs from mixed-method approach. The terms 'mixed-method' approach and 'multi-method' approach are often used interchangeably. However, it is important to distinguish between the two terms and approaches.

The mixed methods approach is defined as a research in which the investigator collects and analyzes persuasively and rigorously both qualitative and quantitative data by mixing and treating them together as a whole. [220-221] These data can be mixed either concurrently by combining them or merging them or sequentially by having one build on the other or embedding one within the other.[221] In mixed methods approach, the researcher gives priority to one or to both forms of data and frames the study procedures within more than one philosophical worldviews (paradigm).

The multi-method approach is "the conduct of two or more research methods, each conducted rigorously and complete in itself, in one project. The results are then triangulated to form a complete whole".[222] The major difference between multi-

method and mixed-method approaches is that in multi-method approach, each study (method) is conducted separately and is complete in itself.[222-223]

In this study, each set of data were collected, analysed and presented separately and then some of the main findings were compared and triangulated in the discussion chapter. All the data were collected at the same time. It might have been better to use the sequential explanatory strategy to inform the design of a subsequent qualitative study by the findings of a previous quantitative study.[224] This might help to design the subsequent approaches in ways that explore in depth some of the identified issues. However, because of the limited time and funds available, this approach was not feasible.

## 4.4. Methods of data collection

Data collection was carried out between 2011 and 2012. Different types of data were collected from different sources. Table 5 shows the methods used, their objectives and the chapters in which these are presented.

**Table 5: The correspondence between the thesis objectives and the results chapters**

| Objective | Method of data collection | Sources* | Result chapter |
|---|---|---|---|
| To evaluate what services and resources are available for diabetes care against national standards. | Standard checklist | PHCCs | Chapter 5 |
| | Service evaluation questionnaire for medical directors | PHCCs, AGH, ACH, ADC | Chapter 5 |
| To estimate the registered prevalence of diabetes, its complications and pattern of service utilization. | Extracting related healthcare data from routine statistical reports | PHCCs, AGH, ACH, ADC, RHA | Chapter 5 |
| To describe people with diabetes in Abha and assess some process and outcomes measures of diabetes care. | Review of the case notes of patients with diabetes using data collection forms | PHCCs, ADC | Chapter 6 |
| To explore views, priorities and perceptions of key stakeholders** regarding diabetes care. | Semi-structured interview schedules | PHCCs, AGH, ACH, ADC, RHA | Chapter 7 |
| To explore healthcare leaders views on the priorities for improving diabetes care. | Questionnaire for priority ranking of different recommendations | RHA | Chapter 8 |

**PHCCs: Primary Health Care Centres, AGH: Abha General Hospital, ACH: Aseer Central Hospital, ADC: Aseer Diabetes Centre, RHA: Regional Health Affairs*

***People with diabetes, healthcare professionals, managers and pharmacists*

### 4.4.1. *Evaluation of diabetes service provision (chapter 5)*

Evaluating the structure and provision of diabetes services had three main objectives. The first was to evaluate the availability of the resources of diabetes care in the PHCCs. Observation of available resources using a checklist is generally considered as a gold standard for other assessment methods; however, few empirical studies have validated this.[225] Therefore, a standard checklist for required resources, which was developed by local experts from the MOH, was used to assess, by direct observation, the available resources. This standard checklist was used because it was developed based on the national standards of diabetes care in primary healthcare. A numerical scoring system was developed for the standard checklist to allow for valid comparison between the PHCCs.

The second objective was to assess whether strategies and policies are available for diabetes care and whether some specific services are delivered for patients with diabetes. Therefore, two separate structured questionnaires, one for the PHCCs and one for secondary healthcare, were developed by the researcher (AA) to assess the availability of these strategies and the provision of these services. The questionnaires were administered by face to face interviews with the medical director of each healthcare institution. These interviews supply information about what is available and what is routinely done. The face to face interviews allow the researcher to elicit much fuller information, probing responses to stimulate memory and give more explanation to make sure the questions were appropriately understood and the correct answers were obtained. Although most of the questions were closed-ended questions, the responses could be biased. The medical directors might give responses that underestimate what is available because of perceiving that this might bring more

resources. On the other hand, they might overestimate what is available in order to show that the care is done properly and there are no deficiencies. However, it was difficult to whether response bias was a problem.

The third objective was to estimate the registered prevalence of diabetes, its complications and pattern of service utilization. The available routine data might be sufficient to serve these purposes. Every month, the PHCCs and hospitals have to collect, assemble and send healthcare statistical reports to the regional health authority. These reports include a variety of data and information that cover for example, demographic characteristics of registered population, patient attendances, healthcare activities and some other vital statistics. Therefore, the researcher decided to collect these routine reports for the preceding 12 months to extract and analyze the relevant routine data on diabetes prevalence, complications and how the diabetes care is utilized. As a result, 168 healthcare statistical reports were collected from different sources for the preceding 12 months. Data on diabetes care were extracted by the researcher (AA) from the reports and transferred to excel files for analysis.

These are secondary data because they are being used for purposes secondary to the one for which they were collected, but they are potentially rewarding, can be very cost-effective and can make a powerful contribution.[199, 226] However, care must be taken with the potential shortcomings such as incompleteness, inaccuracy and unknown quality.[199]

### 4.4.2. *Case note reviews (chapter 6)*

The review of the patients' case notes sought to describe the characteristics of people with diabetes in Abha and assess some process and outcomes measures of diabetes care. Case notes are the most obvious sources of data and have been used for various methods of assessing healthcare.[217] Case note review allows for retrospective assessment of routine provider performance and can assess a large number of cases.[225] It enables the researcher to assess all the full range of patients with diabetes including severely ill, newly diagnosed, compliant and non-compliant patients. Therefore, two structured data collection forms, one for the PHCCs records and one for the Aseer Diabetes Centre records, were developed and piloted to obtain the required data. In each PHCC, two to three members of the project team reviewed all the records of patients with diabetes and filled one form per patient. In Aseer Diabetes Centre, three team members reviewed a sample of the records of registered patients.

Reviewing patients' records (case notes) are clearly an excellent source of data[217], however, they have limitations. For example, there is no control over the data available and there is limited control over missing records and missing records data. The patients' records are not always available and accessible; sometimes it is difficult to identify the case notes of particular types of patients such as patients with diabetes. Hand-written notes may be unformatted, difficult to search and hard to read.[227]

### 4.4.3. *Stakeholder views (chapter 7)*

The views of both the providers and the users of diabetes care should be explored and considered to inform care improvement. Exploring and eliciting the views of local

interested parties is the most appropriate method sensitive to local concerns and circumstances.[228] Therefore, key informants were interviewed to explore their views, experience, priorities and perceptions regarding diabetes care, its problems, areas of and barriers to service improvement. Four semi-structured interview schedules were developed and piloted. Fourteen physicians were recruited and trained on how to conduct a face-to-face interview using the novel semi-structured interview schedule. The main researcher and the physicians then conducted face-to-face interviews with a systematic sample of 235 patients with diabetes. The main researcher also conducted face-to-face interviews with a purposive sample of 29 healthcare professionals, 13 healthcare managers and 13 pharmacists.

Using the face-to-face Interviewing gives the researcher the opportunity to clarify and explain when questions are not understood. They can probe in depth to obtain key facts and discuss responses. The interviewees also have the chance, during or at the end of the interviews, to review their responses and modify any answer. The semi-structured type of interview schedules was used because specific information, such as having a list of patients' healthcare needs and a list of care problems and difficulties, were required. This type of interview schedules helps the researcher to remain flexible to collect information on other important issues as they arise.

On the other side, the disadvantages of face-to-face interview are its high costs, time consuming and need to be conducted by skilled interviewers.

### 4.4.4. *Healthcare leaders' priorities (chapter 8)*

The healthcare leaders are usually very busy to offer time for long interview with a researcher; and their priorities and views are better to be explored using a structured questionnaire with fairly easy list of answers or a rating scale. Therefore, after analysis of the data collected from the above approaches, a questionnaire for healthcare leaders was developed to explore their priorities on some suggested recommendations for improving diabetes care. A purposive sample of 18 healthcare leaders was asked to rate the priority of each recommendation on a rating scale of 0-100%, where 0% was the lowest priority and 100% was the highest priority.

Using self-administered questionnaires was much quicker and cheaper to undertake than interviews. However, this method has some limitations. For example, the response rate tends to be relatively low and there may be more missing answers than in interviews.[229]

## 4.5. Research flow and team development

Figure 14 shows the research flow and phases. The first phase was a preparatory phase which began by a literature review and ended by establishing a research team. The reviewed literature included international and local diabetes management guidelines, authoritative reports and manuals on diabetes care organization and evaluation as well as studies on diabetes in Saudi Arabia. This review helped to give a comprehensive background to the scale of the problem of diabetes in Saudi Arabia in terms of its size, time trend, risk factors, complications and burden. Following this, a research proposal was written specifying the aims, objectives and approaches of the research. Moreover a field/work plan was written which specified the research phases, tasks and sources of data. The research tools such as the data collection forms, questionnaires and interview schedules were then designed and piloted. Ethical approvals and permissions to conduct the project were obtained from the University of Dundee, the King Khalid University and the Regional Health Affairs (RHA) in Abha city (Appendices 4- 6).

Grants and support was also obtained from the University of Dundee, the King Khalid University and the Saudi Ministry of Health. With this support, the researcher established 16 research teams across Abha city. Inviting team members to participate in the project included several methods such as email invitation letter, phone calls, online invitation form, and direct visits to the PHCCs and diabetes centre. Figure 14 summarizes the organization of the research teams and the tasks of each team. Four supervision teams were developed which included 2 to 3 supervisors who work in the administration of each healthcare sector. The tasks of these teams were to provide training and to monitor the progress of achieving our targets. Eleven working teams, one in each PHCC and one in the diabetes centre, were formed. These teams included

nurses and physicians. The participating nurses were given 2-3 days per week free of work by the RHA to review the case notes of patients with diabetes. The participating physicians conducted interviews with patients.

## Figure 14: Research flow and phases

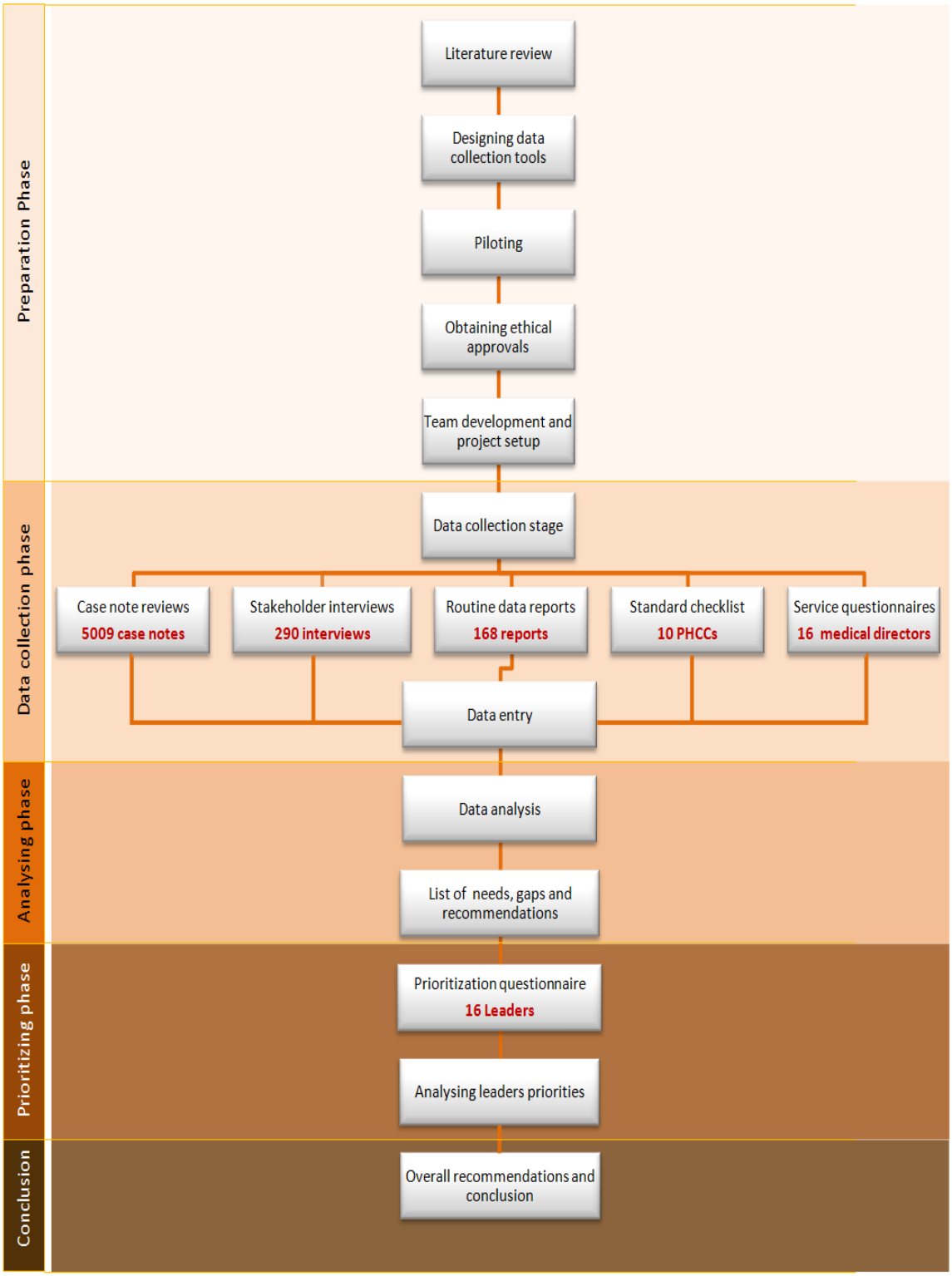
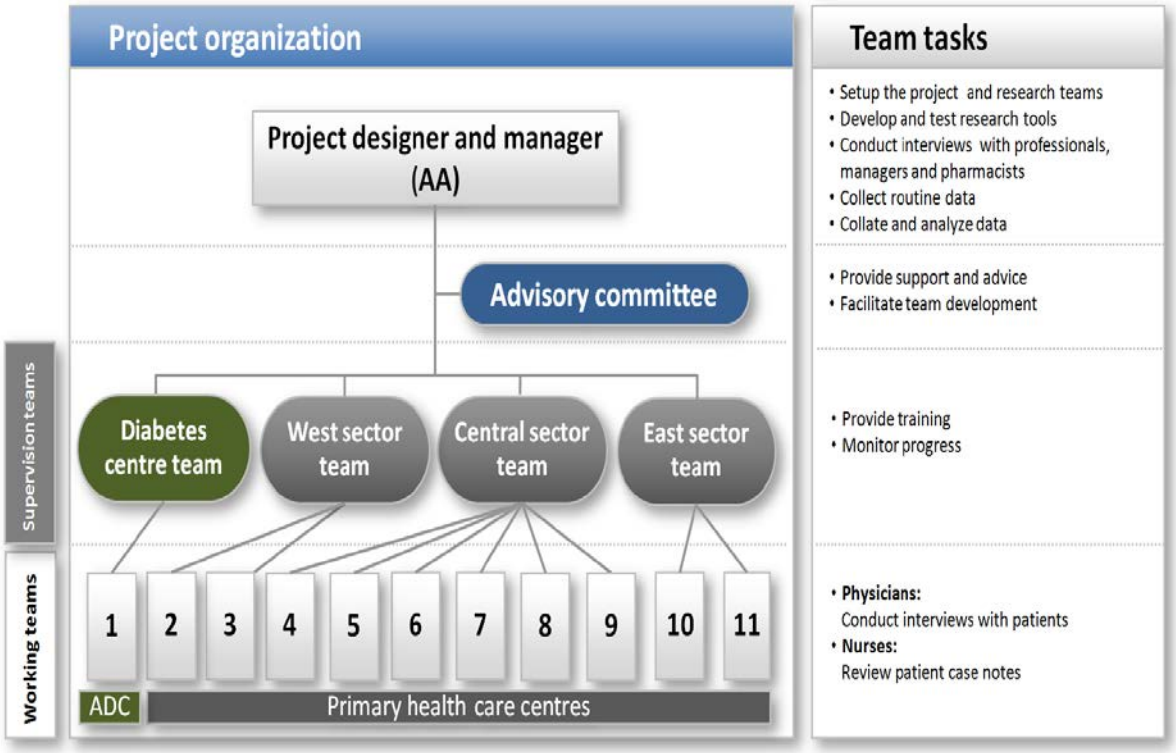


**Figure 15: Project organization and tasks of each team***




**AA: Abdullah Alshehri, the main researcher and author of this thesis, ADC: Aseer Diabetes Centre.*

After developing the research teams, several meetings were convened with the supervision teams to explain and train all the members on how to interview patients and fill in the data collection forms. The supervision teams then visited each PHCC to explain to the working teams how to fill in the forms and how to interview patients. The main researcher (AA) also visited all the PHCCs to provide the teams with the required copies of interview schedules and data collection forms and provide further training. Frequent visits to the different working teams were carried out by the main researcher each week. The aims of these visits were to collect the completed forms and interviews from each PHCC as well as to interview healthcare professionals,

managers, medical directors and pharmacists. Also during these visits, the routine healthcare reports were collected and the standard checklists were filled in. The department of statistics in the RHA was also visited to collect further healthcare reports. The collected data were then transferred to University of Dundee for the purposes of digitalization and analysis. All the data analysis in this thesis was done independently by the main researcher (AA).

# CHAPTER FIVE

# Evaluation of diabetes service provision

*This chapter reviews the organization of the current healthcare system and diabetes care in Saudi Arabia. It gives an overview about diabetes care services in Abha city and presents the results of evaluating in depth the current diabetes services in Abha city against national standards. Several gaps in service provision are discussed.*

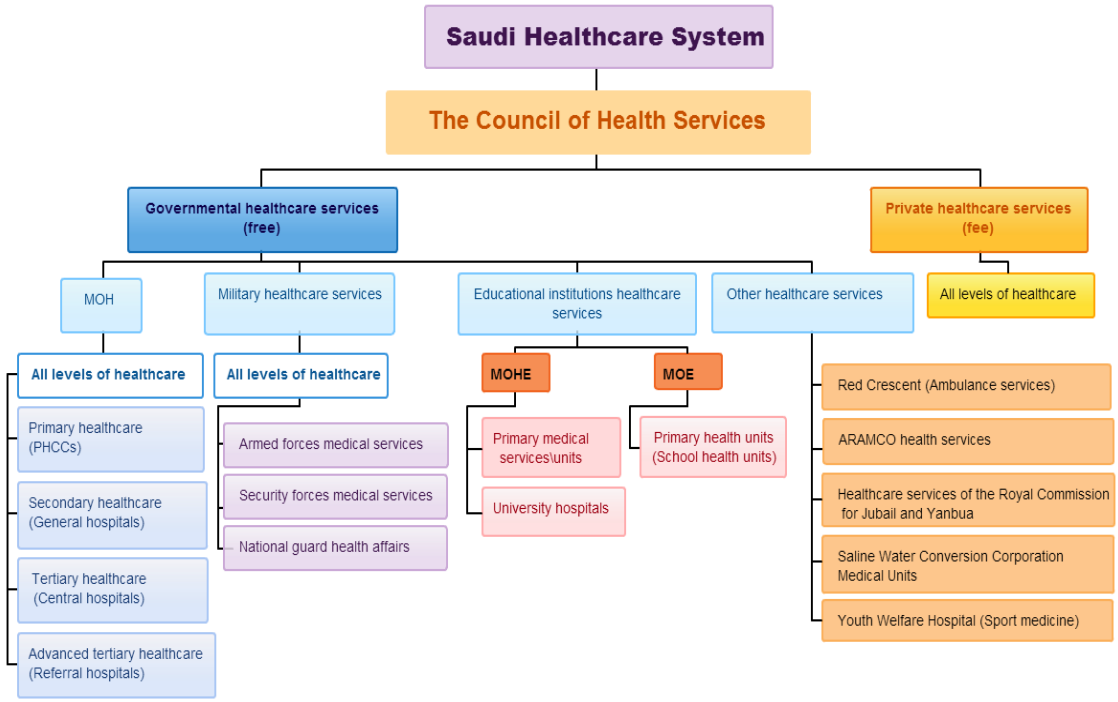
# Chapter 5: Evaluation of diabetes service provision

## 5.1. Introduction

### *5.1.1. Organization of healthcare system in Saudi Arabia*

Many autonomous governmental and private agencies are involved in healthcare delivery in Saudi Arabia. The governmental healthcare services are provided free of charge to all Saudi citizens and expatriates working in the public sectors. Figure 17 shows the different governmental agencies which provide healthcare services in Saudi Arabia. Currently, the Ministry of Health (MOH) and the Saudi Red Crescent provide healthcare services to the whole public while the other governmental agencies such as the military or education agencies provide services to a defined group of the population, usually employees and their families. The MOH is the largest provider of healthcare services in Saudi Arabia, providing almost 59% of inpatient care. [230] The other governmental healthcare providers and the private sectors provide 20% and 21% of the inpatient healthcare facilities respectively.[230]

**Figure 16: Organization of healthcare services in Saudi Arabia***




**MOH: Ministry of Health, MOHE: Ministry of Higher Education, MOE: Ministry of Education*

In 1979, the MOH in Saudi Arabia adopted the WHO primary healthcare approach for achieving the goals of *Health for All by the year 2000.*[216] In 1980, a ministerial decree was issued to establish primary health care centres (PHCCs) by merging the existing local health offices, maternal and child health centres and dispensaries into single units (PHCCs).[231] The PHCCs carried out population census within their catchment areas, opened medical records for each resident and family, and implemented the components and strategies of primary health care in Saudi Arabia.[216]

The MOH currently has 2,109 PHCCs scattered across Saudi Arabia. These networks of PHCCs are the first point of contact with public health providers. Proof of residency within the catchment area of the local PHCC and opening a medical record are

required before services are provided. Each group of PHCCs is linked to a secondary-level local hospital by a referral and feedback system which, in turn, is linked to a tertiary-level central hospital and specialised hospital. Patients who require higher levels of healthcare at MOH facilities must receive a referral form from a PHCC except in case of emergency.

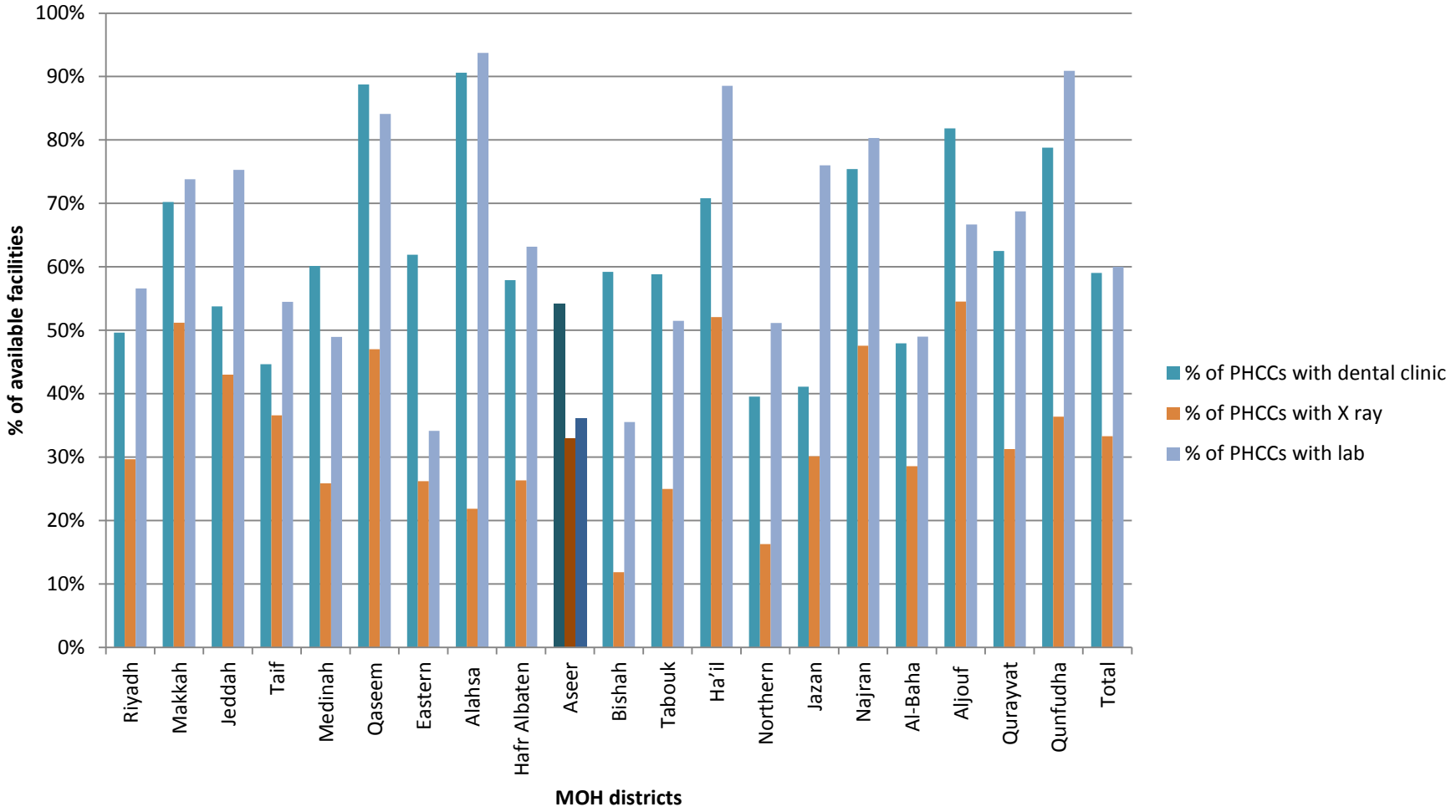
The PHCCs provide healthcare services which are essentially promotional, preventive and curative. They include maternal and child healthcare, treatment of common diseases, management of chronic diseases (e.g. diabetes, hypertension, asthma), immunization, dental care, provision of essential medicines, environmental health, food hygiene, health education and control of endemic diseases.[216] These components of primary health care should be delivered with respect to equity of distribution, community participation, using appropriate technology and cooperation with other governmental sectors.[216] Ideally, each PHCC should include the following units and clinics:

1. General adult clinic for males
2. General adult clinic for females
3. Nursing clinic for males
4. Nursing clinic for females
5. General Paediatric clinic
6. Paediatric nursing clinic including vaccination facilities
7. Maternal clinic
8. Nursing clinic for the maternal clinic
9. Waiting areas

10. Pharmacy
11. Laboratory
12. Mini-clinic for chronic diseases
13. Nursing clinic for chronic diseases
14. Clinic for health education and promotion
15. X-ray unit
16. Dental clinic for males
17. Dental clinic for females
18. Records unit
19. Administration unit
20. Health inspection unit
21. Unit for staff meetings
22. Toilets
23. Room for storage
24. Car parks

At the national level, 60% of PHCCs are equipped with laboratories, 33% with x-ray equipment and 59% have dental clinics.[230] Each centre has, on average, 4 physicians and provides health services to 13,455 persons. In Aseer district, 36% of the PHCCs are equipped with a laboratory, 33% with x-ray equipment and 54% have dental clinics. In comparison to the other districts in the kingdom, Aseer district and the Eastern district had the lowest proportions of PHCCs with laboratory facilities (36% and 34% respectively). The Northern district has the lowest proportion (40%) of PHCCs with dental clinics while Bishah district has the lowest proportion (12%) of PHCCs equipped with x-ray machines ( Figure 18).[230]

## Figure 17: PHCCs of MOH in Saudi Arabia by MOH districts and some selected indicators, 2011[230]



### *5.1.2. Diabetes care organization in MOH*

The increased prevalence of non-communicable diseases, their morbidity and mortality in Saudi Arabia necessitated the government to adopt several initiatives and programmes in order to prevent and control these diseases. The MOH established a General Directorate for preventing chronic diseases which is responsible for tackling and managing the prevalent chronic diseases such as diabetes, hypertension, obesity and asthma.

The organization of diabetes care in developed countries has changed over time. Formerly, in the United Kingdom for example, people with diabetes were usually cared for by hospital clinics.[232] With time, the involvement of general practitioners in taking care of people with diabetes, particularly the routine and primary care, started to increase gradually.[232] Malins and Stuart described the first scheme of involving general practice in diabetes care in 1971.[233] In 1973, Thorn and Russell suggested that care of diabetes at the primary healthcare level is better than at hospital in the United Kingdom.[234]

A similar story happened in Saudi Arabia. In the early years, patients with diabetes usually received primary healthcare at hospital clinics. After the establishment of the primary healthcare centres, the routine care of people with diabetes began to be the responsibility of primary healthcare physicians.

As a result, in 1994, the scientific committee of quality assurance issued guidelines and standards for a quality assurance programme in primary healthcare, which was approved by WHO.[200] It included guidelines and standards for diabetes care at the PHCCs. In addition, a programme of mini-clinics for diabetes, hypertension and asthma

was initiated at the level of primary healthcare in order to improve the control and management of these diseases. The MOH issued several guidelines and manuals to organise and appropriately implement this programme at all PHCCs.[201-202, 235]

The main aim of the mini-clinic initiative is to standardize the process of care of patients with chronic diseases according to the best evidence and with optimal use of the available resources. Its objectives are first, to prevent the chronic diseases by:

- Reducing risk factors,
- Detecting people at risk,
- Screening them for early diagnosis,
- Early detection of complications and
- Health education.

The second objective is to manage patients through a follow up appointment system and shared care with hospitals. The third objective is to promote optimal use of drugs by patients.[201-202, 216]

In 2008, the Gulf Committee for Control of Diabetes (GCCD) published an executive plan for control of diabetes in the Arabian Gulf countries. This plan was considered as a comprehensive guidance plan for the forthcoming ten years. Each country should put its operational plan within the components of this plan with taking proportionality into account for each country. The plan stated 7 objectives to achieve control of diabetes and improve diabetes care at all levels of healthcare.

These objectives are:

1. Primary prevention of T2DM.

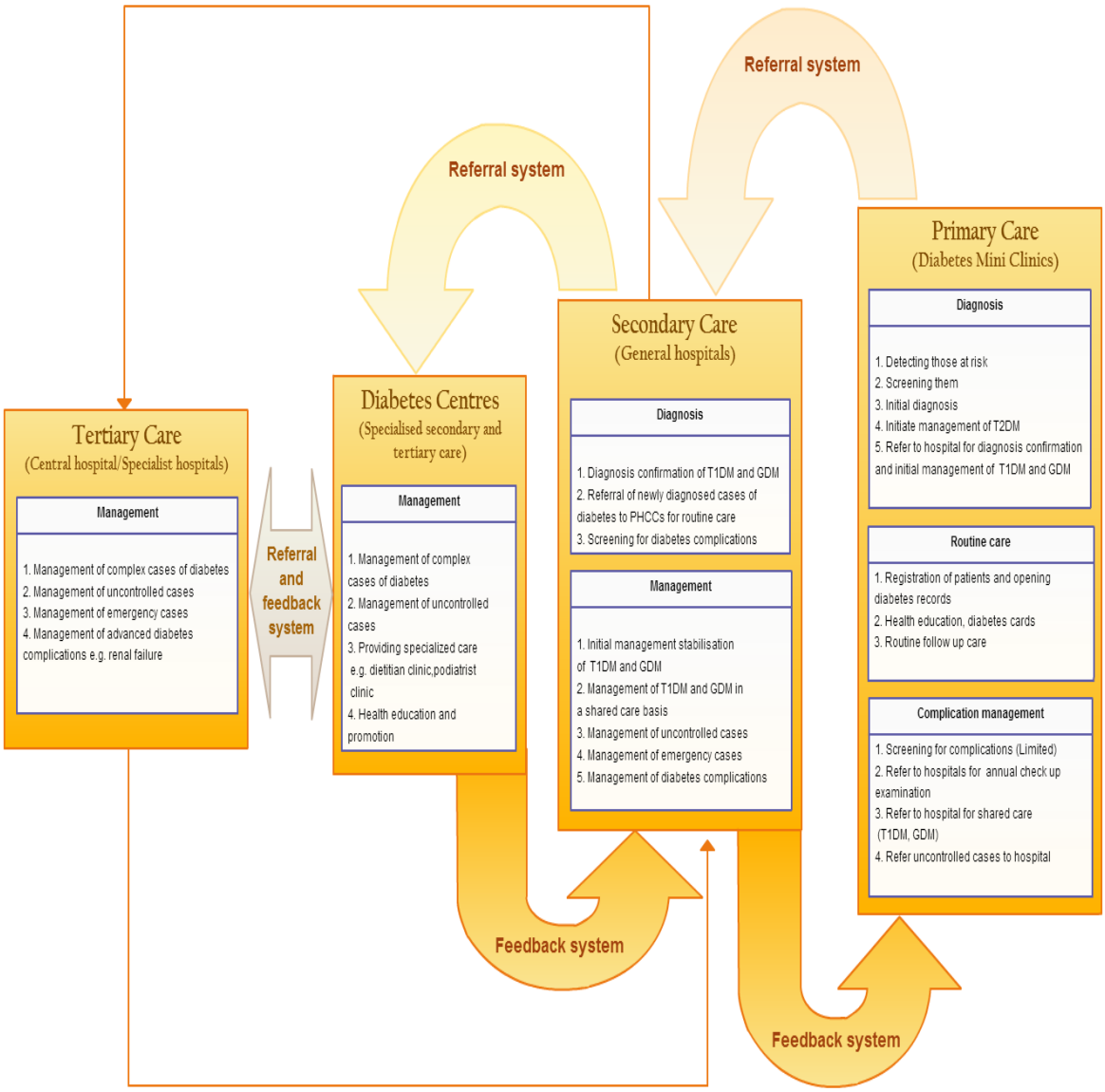
2. Secondary prevention of T2DM.
3. Quality Improvement of health services at all levels of healthcare as provided to patients with diabetes.
4. Support of methods of control, monitoring, and evaluation of diabetes.
5. Conduct and support of diabetes research and studies.
6. Empowerment of patients and their families to take part in control of diabetes and its complications.
7. Activating community participation and partnership for control of diabetes.

Each objective included several targets, strategies, implementation mechanisms and performance indicators.[215] In Saudi Arabia, there was no operational plan except the already established mini-clinic programme at the level of primary healthcare.

At the secondary healthcare level (hospitals), different specialist clinics were established such as ophthalmology, nephrology, endocrinology and nutrition clinics where referred patients can be managed at the request of the primary healthcare physician.[200] At these clinics, specialist or consultant physicians usually examine referred patients to confirm diabetes diagnosis and initiate treatment or to manage uncontrolled diabetes and its complications.[200] Primary healthcare physicians should also refer patients with diabetes each year to the general hospital in order to screen patients for any complications. If a patient needs advanced treatment, the treating physician will refer the patient to a tertiary hospital or to a diabetes centre where specialised and advanced care is offered.[200] Children, pregnant women, patients with T1DM and those with known complications of diabetes need to be managed by shared care with hospitals through the referral and feedback system (Figure 19).[200]

More than 20 diabetes centres were opened across Saudi Arabia. These specialist centres provide secondary and tertiary care specific for people with diabetes in cooperation and integration with both PHCCs and hospitals. Diabetes centres also provide health education and promotion services.

**Figure 18: Diabetes care services and pathway in MOH, Saudi Arabia**



### *5.1.3. Overview of diabetes services in Abha*

Diabetes care services in Abha are provided by 10 individual primary healthcare centres (PHCCs), one general (maternity) hospital, one central hospital and one specialist diabetes centre. The healthcare services that are provided to those with diabetes by these PHCCs and hospitals are similar to what has been briefly described in figure 19.

The PHCCs and their staff provide the healthcare services to those with diabetes either through the general clinic or the diabetes mini-clinic. The general clinic provides general medical care to all the registered population including those with diabetes. The diabetes mini-clinic provides the other elements of diabetes care services.

Abha General Hospital (AGH) is a maternity hospital with a variety of outpatient specialist clinics. The outpatient clinics provide healthcare services to all people with diabetes based on referral from either the emergency department of the hospital or from the PHCCs. Pregnant women with diabetes or gestational diabetes receive shared care by both the PHCCs and AGH. In case of emergency, the pregnant woman can be managed in the AGH emergency department and can be admitted in AGH for inpatient treatment.

Aseer Central Hospital (ACH) provides a wide range of specialist services for patients with diabetes. These services include emergency care; inpatient care such as managing diabetes complications (e.g. amputation surgery), outpatient follow-up care, laboratory services and pharmacy services. The hospital also takes referrals as appropriate through its outpatient clinics.

Aseer Diabetes Centre (ADC) is a specialist centre for diabetes care. It provides follow up care for referred patients. The follow-up care includes management of diabetes and its complications. Patients with diabetes are registered in the centre based on referral from either the PHCCs or the hospitals.

## 5.2. Objectives

The aim of this chapter was to identify gaps in service provision for people with and at risk of having diabetes in Abha city, by comparing what was provided against national standards. This aim implies several objectives. The first objective was to evaluate whether the diabetes services are structured and resourced in such a way as to allow quality care to be delivered. This requires assessing the availability of the resources for diabetes care in both the primary and secondary healthcare. The second objective was to explore how diabetes is managed by reviewing the organization and delivery of the current diabetes care services. The third objective was to collect and analyze the available routine data on diabetes care in order to estimate the local prevalence of diabetes and its complications and to describe the pattern of service utilization.

## 5.3. Methods

### 5.3.1. *Mini-clinic evaluation checklist for PHCCs*

A comprehensive checklist for evaluating the structural resources of the mini-clinics at the PHCCs was devised by experts in the department of primary healthcare and preventive medicine at the Regional Health Affairs (RHA) in Aseer region. This checklist

was used to identify the unavailable resources in each mini-clinic. A meeting was convened, by the researcher (AA), with 4 of those experts who developed the checklist. The aim of the meeting was to discuss how this checklist could be used in this study and how to improve its use. In the meeting, the researcher suggested developing a scoring system that enables the evaluators to assess and compare among clinics different aspects of resource availability by having: a total score that reflects the completeness of the clinics' resources; a sub-score for the resources of each important functional unit of the clinic; higher scores to those important resources.

Some items in the checklist were not actually resource-related items, therefore, the committee agreed to remove them from the list. At the end of the meeting, a consensus was reached on the score of each item in the list (Appendix 7) and a numerical scoring system for the checklist was developed. This scoring system was established on a scale of 0-10. A score of 0 reflects absence of the item in the mini-clinic and scores of 1-10 reflect the presence of the item in the mini-clinic. The availability of some items in the mini-clinic is more important than other items. Therefore, the scores from 1-10 rank the importance of the availability of the items in the mini-clinic. For example, a score of 1 for an item means that the item is available in the mini-clinic and its importance rank is 1. Another item is given a score of 10 which means that the item is available and its availability importance is 10 (the highest importance available). The total score is obtained by summing the score of each item. By this system of scoring, the researchers were able to give a total score for each mini-clinic in the city which reflects both the availability of each item and the availability of important items.

The resources of each mini-clinic were then evaluated using the checklist. The researcher, accompanied by the medical director of each PHCC, visited the mini-clinics and assessed the available resources by direct observation and by reviewing the routine monthly statistical reports.

The evaluation checklist was divided into 7 parts including, important functional units, waiting space resources, consultation room resources, nursing room resources, laboratory resources, health education resources and pharmacy resources. Each part includes a list of resource items that should be available in each part of the PHCC (Appendix 7).

### 5.3.2. *Service provision questionnaire for PHCCs*

By reviewing the quality assurance in primary healthcare,[200] the MOH mini-clinics guidelines,[201-202, 216] and the Gulf Executive Plan for Control of Diabetes,[215] additional questions were organised into a structured interview questionnaire. This questionnaire was developed to review the current provision of diabetes care services in PHCCs and to identify the gaps in service provision with emphasis on the processes of diabetes care (Appendix 8). Specific questions were added to the questionnaire about whether some evidence based cost effective services are delivered for patients with diabetes or not.[206, 236-237] Most of the questions were closed questions and their answers were collected by face to face interview with the medical director of each PHCC. Each PHCC was visited by the researcher and permission to conduct the interviews was taken from the PHCC manager either verbally or by submitting a request. A consent form was also collected from each interviewee.

### 5.3.3. *Service provision questionnaire for secondary care*

Another structured questionnaire was developed for reviewing the provision of diabetes care services at the level of secondary healthcare (hospitals and diabetes centre), (Appendix 9). In Saudi Arabia, there were no guidelines or manuals for the clinical standards or processes of how to manage diabetes at hospitals or diabetes centres to compare against. However, by reviewing the Gulf Executive Plan for Control of Diabetes,[215] several questions that cover the essential components of diabetes care were organised into a structured interview questionnaire. The questionnaire included questions about availability of strategies for tackling diabetes at the national or regional level, availability of essential resources such as antidiabetic drugs, records, education materials and specialist clinics. In addition, the questionnaire asked also about the workforce profile and provision of some specific services for people with diabetes.

The medical directors, nurse managers or physicians who work in the outpatient clinics of AGH, ACH or ADC were interviewed by the researcher. These professionals were selected because they are the key stakeholders who know about the available services and resources for diabetes care. Formal permission to conduct the interviews was obtained from the hospital managers and consent forms were completed by the interviewees.

### 5.3.4. *Service utilization and healthcare burden*

Routinely collected data can answer some research questions despite being collected for other purposes, often unrelated to research. Routine data can provide information

on the use of healthcare resources and on the frequency of the different diseases.[238] In Abha city the available routine data, which were often collected for statutory and administrative purposes, were expected to give sufficient information on the local prevalence of diabetes, its complications and on the pattern of service utilization. In each clinic, unit or department in the PHCCs or the hospitals, there is a specific register for some data about the characteristics of the visiting patients and some related healthcare activities. Every month, the medical directors/managers of each healthcare institution (e.g. PHCC, hospitals, diabetes centre) have to extract data from large bound paper ledgers. These data are then assembled in form of a standard statistical report that is sent regularly to the regional health authority. These reports (168 reports) were collected from the department of statistics in the regional health authority. The collected reports were in a paper format and cover the preceding 12 months for all the PHCCs, AGH, ACH, and the ADC. The data on diabetes prevalence, complications, service provision and utilization were all extracted by the researcher (AA) from the reports and transferred to excel files for analysis. Estimating the local registered prevalence of diabetes would indicate how effective the screening services for diabetes are. Moreover, estimating the prevalence of diabetes complications, using routine data, is one of the methods of assessing diabetes care by one of its outcome measures. Using routine data to evaluate service provision and utilization would help to estimate the current workload in terms of time and place and might show the effect of insufficient resources on the processes of diabetes care.

## 5.4. Results

### *5.4.1. Primary healthcare services*

***Mini-clinic resources evaluation (structure of diabetes care):***

The availability of the resources to implement the mini-clinic programmes was evaluated in each PHCC. The scoring system showed that none of the 10 mini-clinics in Abha were completely equipped. The mini-clinics of Almowadafeen and Sultan city PHCCs were the best equipped mini-clinics followed by Almansak and Alnumais mini-clinics (Table 6). The mini-clinics of Therah and Alaziziah PHCCs were the least equipped clinics in Abha.

*Availability of Important functional units:*

The buildings of seven PHCCs were rented houses while three, Almowadafeen, Sultan city and Alnumais PHCCs, were governmental buildings. There was no laboratory or dental clinic in Johaan PHCC. An ambulance was available only in Alkaabel and Alnumais PHCCs. All the PHCCs have waiting area for patients, consultation room for doctors, pharmacy and telephone lines. The nurses of the mini-clinics of Johaan and Alnumais PHCC do not have separate rooms. Also, there were no separate rooms for health education/promotion clinics in three PHCCs, Wasat Abha, Alaziziah and Alnumais. An X-ray unit was available in 5 PHCCs only.

**Table 6: Evaluation of the resources of diabetes mini-clinic in each PHCC***

| Centre's name | Important functional units & resources | Waiting spaces | Consultation room resources | Nursing room resources | Laboratory resources | Health education/promotion room resources | Pharmacy/ drug resources | Total Score |
|---|---|---|---|---|---|---|---|---|
| **Ideal score** | **116** | **26** | **52** | **83** | **12** | **22** | **56** | **367** |
| **Almowadafeen** | 102 | 18 | 38 | 70 | 8 | 14 | 39 | **289** |
| **Sultan city** | 91 | 22 | 44 | 73 | 7 | 10 | 38 | **285** |
| **Almansak** | 76 | 22 | 41 | 67 | 9 | 19 | 45 | **279** |
| **Alnumais** | 95 | 17 | 34 | 65 | 10 | 7 | 39 | **267** |
| **Almanhal** | 82 | 18 | 38 | 65 | 8 | 15 | 39 | **265** |
| **Alkaabel** | 91 | 17 | 33 | 57 | 5 | 7 | 36 | **246** |
| **Johaan** | 45 | 22 | 42 | 77 | 2 | 17 | 28 | **233** |
| **Wasat Abha** | 70 | 18 | 24 | 58 | 9 | 6 | 35 | **220** |
| **Therah** | 71 | 8 | 28 | 50 | 8 | 11 | 28 | **204** |
| **Alaziziah** | 65 | 13 | 29 | 47 | 8 | 13 | 15 | **190** |
| **Median** | **79** | **18** | **36** | **65** | **8** | **12** | **37** | **255.5** |

* *Green coloured scores are the 4 lowest scores in each category*

In Abha city, the total population served by PHCCs was 126,767 persons. Table 7 shows the workforce profile for all the PHCCs in Abha city. The total working physicians in primary care were 53 physicians. Only six of them were family medicine trained physicians. The number of physicians broadly followed population size in each PHCC. However, there were quite large inconsistencies. For example, in Alaziziah PHCC, each physician delivers healthcare services to 1465 persons while in Wasat Abha PHCC, each physician delivers healthcare services to 4021 persons. Moreover, each nurse in Johaan PHCC, for example, delivers healthcare services to 211 persons while in Wasat Abha the nurse delivers healthcare services to 1058 persons. This would indicate that the workload is high on the healthcare staff of Wasat Abha PHCC compared with other PHCCs. The laboratory of Almansak PHCC needs a laboratory technician and the x-ray units of Almowadafeen and Sultan city PHCCs need x-ray technicians. The table

indicates that there is a need to redistribute the working staff of some professions such as laboratory technicians and midwifes.

*Waiting spaces:*

Almanhal, Wasat Abha, Alaziziah and Therah PHCCs had limited waiting areas while Alkaabel, Alaziziah, Alnumais and Therah PHCCs do not have nearby toilets.

*Consultation room resources:*

Resources for the consultation rooms were apparently inadequate. For example, an ophthalmoscope was not available in 4 PHCCs and tuning fork was not available in 6 PHCCs. Monofilament was not available in 8 PHCCs. Some physicians use their own instruments; however, these instruments should be provided by the MOH and should be available at all times in the mini-clinics.

**Table 7: Workforce profile of all the PHCCs in Abha city**

| PHCC | Total population | Physician | FM physician* | Dentist | Nurse | midwife | pharmacist | Lab technician | X-ray technician | Health inspector | Administrative technician |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Almanhal** | 18593 | 6 | 1 | 3 | 15 | 2 | 3 | 2 | 1 | 1 | 3 |
| **Wasat Abha** | 20105 | 5 | 0 | 2 | 19 | 0 | 2 | 2 | 1 | 1 | 3 |
| **Almansak** | 9774 | 5 | 1 | 2 | 16 | 2 | 2 | 0 | 0 | 1 | 1 |
| **Almowadafeen** | 19473 | 6 | 2 | 2 | 23 | 0 | 2 | 1 | 0 | 2 | 4 |
| **Johaan** | 1264 | 1 | 0 | 0 | 6 | 0 | 1 | 0 | 0 | 1 | 0 |
| **Sultan city** | 10015 | 4 | 0 | 1 | 13 | 3 | 1 | 1 | 0 | 1 | 2 |
| **Alkaabel** | 14082 | 5 | 0 | 2 | 15 | 2 | 1 | 1 | 0 | 1 | 2 |
| **Alaziziah** | 7323 | 5 | 0 | 2 | 12 | 1 | 3 | 1 | 0 | 1 | 2 |
| **Therah** | 7655 | 4 | 1 | 2 | 13 | 2 | 2 | 1 | 0 | 1 | 4 |
| **Alnumais** | 17763 | 6 | 1 | 2 | 15 | 2 | 3 | 1 | 1 | 2 | 3 |
| **Total** | **126767** | **47** | **6** | **18** | **147** | **14** | **20** | **10** | **3** | **12** | **24** |

**FM physician: Family medicine physicians with either diploma or higher degree in family medicine*

*Nursing room resources:*

The nursing rooms were not completely equipped. Wasat Abha and Alaziziah nursing rooms had insufficient strips for the glucometer. An electrocardiogram (ECG) machine was available in 5 mini-clinics; however, tracing papers were sufficiently available in 2 mini-clinics only. A computer with printer and scanner were only available in 2 mini-clinics. Specific drugs called standard emergency drugs should be available in the nursing room of each mini-clinic; however, they were not available in the nursing rooms of 4 mini-clinics. Health education materials were available in the nursing rooms of all the PHCCs.

*Laboratory resources:*

Laboratory facilities were also inadequate. Complete blood count test (CBC) was available in 7 PHCCs. HbA1c test and blood electrolytes were not available in any of the PHCCs. Blood glucose testing and urine dipsticks were available in all of the PHCCs. Erythrocyte sedimentation rate (ESR) and lipid profile tests were available in all the PHCCs except in Johaan PHCC.

*Health education resources:*

Seven PHCCs have dedicated a room for health education and promotion. Projectors were available in 4 PHCCs and TV (LED/LCD) was available in only 1 PHCC. Health promotion registers and records were not available in Wasat Abha PHCC.

*Pharmacy resources (medications):*

Two types of medications should be available in each PHCC according to the MOH updated essential drug list in December 2010. The first type should be available in the

pharmacy and the second type is an emergency type which should be available in the nursing room.

Of the first type, oral antidiabetic (Glibenclamide, Metformin, and Gliclazide) and insulin (Isophan and regular) were available in all the pharmacies. Mixed Insulin (Mixtard) was available in Almanhal and Wasat Abha PHCCs while the Lantus pen was only available in Almanhal PHCC. Of Angiotensin-converting enzyme inhibitors (ACEIs), only Captopril was available in all the pharmacies while other ACEIs were not available. Of Angiotensin Receptor Blockers (ARBs), only Losartan was in the updated list and it was not available in all the PHCCs. Aspirin was available in all the pharmacies while statins (Simvatatin) was only available in 3 PHCCs (Almanhal, Almansak, Almowadafeen PHCCs). Other Statins in the list were not available (Pravastatin and Atrovastatin).

Of the second type (emergency drugs), Dextrose 50% and Ringer lactate were available in 9 nursing rooms of mini-clinics. Adrenalin injections were available in 9 PHCCs, Atropine injections in 8 PHCCs, and Antihistaminic injections in 5 PHCCs.

### *Evaluation of the service provision questionnaire (process of diabetes care):*

All 10 medical directors of the 10 PHCCs were interviewed. In addition to closed questions (yes or no), the respondents gave comments and explanations for their answers (Appendix 8). The interviewees used their knowledge, experience and clinical judgment to answer the questions. In this study, there were only 10 data points (answers) for each variable (question) which limit the analysis of data. However, the important findings and key deficiencies are reported in the following paragraphs.

There was no computer system, programs or electronic database for diabetes in any of the PHCCs. However, some PHCCs had computers that are used for limited administrative purposes such as typing and printing documents. There were also standard forms for monthly and yearly data collection that are used in each clinic in the PHCC to report its statistical data including data about diabetes. This has been considered by some medical directors as a system for diabetes data collection.

All the PHCCs implement the programme of diabetes mini-clinics. They have assigned a specific equipped room for the clinic together with one or two physicians and one or two nurses. Other important parts of the programme were established in all the PHCCs such as having diabetes register, specific records for each patient with diabetes, and a system for identification of the record of the family of any patient with diabetes. Each PHCC has an appointment system for patients' follow-up, defaulters' follow-up system, referral and feedback system and forms. Nine PHCCs reported that they received the hospital feedback forms from patients rather than by post.

The local guideline for diabetes management[214] was available in all the PHCCs. However, the protocol for emergency management of hypoglycaemia and ketoacidosis was not available in 5 PHCCs. A new national clinical practice guideline for diabetes management in primary healthcare was published while this study was underway. This guideline was not available in any of the PHCCs. There was no referral guideline that organizes and explains in detail criteria for referring patients and procedures for referral and feedback. Eight PHCCs reported that they do not receive hospital feedback for each referred patient.

Wasat Abha PHCC has not implemented the health education and promotion initiative and has not assigned a specific clinic for it. There were no trained physicians on diabetes management in Wasat Abha and Alkaabel PHCCs. Nurses at all the mini-clinics received some training on diabetes management except those in Almansak PHCC.

The survey showed that there are two family medicine consultant diabetologists who work in the family medicine training programme and sometimes cover the diabetes mini-clinics of Almanhal, Almansak and Almowadafeen PHCCs. There were no dieticians, podiatrists or health educator specialists in any of the PHCCs.

When the medical directors were asked about delivering specific education programme for patients with diabetes, all replied that there is no specific well structured programme for educating people with diabetes. However, there are some guidelines and educational checklists for the primary healthcare teams to consider when educating their patients as part of the mini-clinic programme. None of the PHCCs deliver any home care for people with diabetes. All those with diabetes complications are referred to AGH, ACH or ADC for management. Six medical directors reported that there were some difficulties in accessing the hospital laboratory and requesting some tests for patients such as renal function test, HbA1c test and lipid profile.

Some of the known cost-effective diabetes services are provided as part of the mini-clinic programme. For example, retinopathy screening for all patients with diabetes and foot screening for those at high risk are provided in AGH through the referral for annual review. Screening obese people for IGT is provided in each mini-clinic of each PHCC.

All the primary healthcare medical directors reported that they do not provide the following diabetes services in their PHCCs:

1. A programme for tight control of blood glucose and blood pressure for patients with diabetes.
2. Retinopathy screening for all patients with diabetes.
3. Foot screening for those at high risk.
4. Multiple risk factor management programmes.
5. A structured patient self-care education programme.
6. Reduction of obesity and physical inactivity in high-risk groups.

### *5.4.2. Secondary healthcare services*

***Evaluation of the service provision questionnaire for secondary care:***

*Secondary healthcare resources and processes of diabetes care:*

In the outpatient department of AGH, the medical director, the nurse manager and the physician of the diabetes clinic were interviewed by the researcher using the questionnaire described in section 5.3.3 (Appendix 9). In ADC, the manager of the centre (paediatric endocrinologist), and the nurse manager were interviewed. In ACH, a consultant diabetologist was interviewed.

The secondary healthcare specialist teams in AGH, ACH and ADC provide specialist diabetes care services to the Abha population through referral of patients from the PHCCs. The available resources for providing high quality secondary care for people with diabetes were found to be suboptimal. Several deficiencies were identified. Some deficiencies were common to all hospitals and the diabetes centre. These deficiencies

are described first, in the next two paragraphs, and specific deficiencies for each healthcare institution are then identified.

The interviews confirmed that there is no National Service Framework to address variation in standards of diabetes care and to achieve greater consistency in the availability of services and resources. The Gulf Executive Plan for Control of Diabetes was considered as a national strategy for tackling diabetes in Saudi Arabia by four of the six interviewees. There was no published national or local operational plan for control of diabetes. Further, there was no local managed clinical network for diabetes management or published diabetes care pathway. At the level of secondary care, there was no national or local clinical practice guideline for diabetes management. However, some physicians stated that they follow other guidelines such as the American Diabetes Association (ADA) guideline and the American Association of Clinical Endocrinologists (AACE) clinical practice guidelines. There were no national or local strategies for promoting physical activity or healthy eating, even though the Gulf Executive Plan for Control of Diabetes recommends setting and implementing strategies for promoting physical activity and healthy eating.

In AGH, ACH and ADC, there is no electronic database or system that enables provision of data for evaluation of diabetes care. On the other hand, there is a simple paper-based system for collecting brief data about diabetes statistics.

*Abha General Hospital (AGH):*

In the outpatient clinics of AGH, there is a specific diabetes clinic which provides a wide range of diabetes care services such as taking referrals, confirming diagnosis, and conducting annual check-ups. The physicians who cover the clinic were either

specialists or consultants in internal medicine but were not diabetologists. There is an appointment system for those patients who were referred from the PHCCs but there is no follow-up system for registered patients or defaulters. There was an ophthalmology clinic, dermatology clinic, dietetic clinic and clinic for emergencies. In addition, there was a specialist clinic for pregnant women with diabetes which was covered by an obstetrician. There was no foot care clinic (podiatry services) or health education clinic. However, health education leaflets and diabetes identification cards were available. A pharmacy and a laboratory were available.

The hospital recently started the process of opening a diabetes register with a specific file for each patient visiting the hospital. The referral of patients to other clinics in the same hospital or to other hospitals is available. However, there is no feedback system or feedback form and there is no guideline for explaining the referral process. The outpatient clinics provide specific diabetes services to those patients who were referred for annual review. These services include, retinopathy screening, foot screening, ECG, chest x-ray and conducting several laboratory investigations such as blood glucose, urine dipstick, cholesterol, triglycerides and creatinine tests. On the other hand, the outpatient clinics do not provide the following diabetes services:

1. A programme for tight control of blood glucose and blood pressure for patients with diabetes.
2. Screening obese people for IGT.
3. Multiple risk factor management programmes.
4. A structured patient self-care education programme.
5. Reduction of obesity and physical inactivity in high-risk groups.

Among the staff of the outpatient clinics of AGH, there were no diabetologists, dieticians or podiatrists. There was only one ophthalmologist and one dietetic technician. Only 2 nurses out of 12 nurses in the outpatient clinics had received training on diabetes management.

The available antidiabetic drugs in AGH pharmacy were the following:

1. Metformin tablets, 500 mg
2. Glibenclamide tablets, 5 mg
3. Gliclazide tablets, 80 mg
4. Insulin injections, human isophan, 100 units/ml
5. Insulin injections, human regular, 100 units/ml
6. Mixed human insulin, 100 units/ml (Mixtard)
7. Insulin detmir or insulin glargine 100 units/ml (Lantus vial)
8. Glimepiride tablets, 3 mg, 2 mg

*Aseer Central Hospital (ACH):*

ACH is a central large hospital which takes referrals from other hospitals and provides emergency, inpatient and outpatient specialist diabetes services. There are outpatient clinics for different specialists such as endocrinologists, ophthalmologists, surgeons and many other specialties. These specialist teams provide a wide range of healthcare services for people with diabetes such as inpatient treatment and outpatient follow-up care for patients with diabetes complications. However, there is no specific clinic for podiatry services, dietetic services or health education services.

The available computer (electronic) system in ACH is used mainly for administrative proposes such as registering patients' information and making appointments. There is no recall system for defaulters. Also, there is no electronic records system or electronic database for diabetes. Simple forms are used in the emergency and outpatient departments to collect data on diabetes. This would be considered as a simple paper-based system for collecting data on diabetes.

The referral of patients to other specialist clinics in the same hospital or to other hospitals is available using a specific form. However, there is no feedback system or feedback form and there is no guideline for explaining the referral process.

The hospital provides services for management of all diabetes complications but does not provide the following services:

1. Specific educational programme for people with diabetes.
2. A programme for tight control of blood glucose and blood pressure for patients with diabetes.
3. Retinopathy screening for all patients with diabetes.
4. Foot screening for those at high risk.
5. Screening obese people for IGT
6. Multiple risk factor management programmes.
7. A structured patient self-care education programme.
8. Reduction of obesity and physical inactivity in high-risk groups.

The available antidiabetic drugs in ACH pharmacy were the following:

1. Metformin tablets, 500 mg

2. Glibenclamide tablets, 5 mg
3. Gliclazide tablets, 80 mg
4. Insulin injections, human isophan, 100 units/ml
5. Insulin injections, human regular, 100 units/ml
6. Mixed human insulin, 100 units/ml (Mixtard)
7. Insulin Lispro or Insulin Aspart 100 units/vial
8. Insulin detmir or insulin glargine 100 units/ml (Lantus pen)
9. Insulin detmir or insulin glargine 100 units/ml (Lantus vial)
10. Glimepiride tablets, 3 mg, 2 mg, 1mg
11. Glucagon powder 1mg/vial

*Aseer Diabetes Centre (ADC):*

In ADC, several specialist diabetes services are provided which include general clinics for routine diabetes care of adults, specialist clinic for children with diabetes, diabetic foot clinic, diabetic eye clinic, insulin pump clinic, nutrition and dietetic clinic and health education clinic. The centre has a diabetes register, specific record for each patient with diabetes, an appointment system without a recall system for defaulters. The centre does not include a pharmacy or laboratory but has full access to the ACH laboratory services and pharmacy. Also, the referral to ACH emergency or outpatient clinics is available using a specific referral form and any feedback will be kept in the ACH record of the patient. However, there was no guideline for the referral process. Health education materials were available in the centre.

The working team in ADC was inadequate. The current workforce profile of ADC was as following:

- One consultant paediatric endocrinologist,
- One internal medicine consultant,
- Two internal medicine specialists,
- Three general physicians, two of whom have a diploma in diabetes management,
- Four nurses with training on foot care
- Five nurses with training on diabetes education
- Eleven general nurses
- Two dieticians
- Five administrative technicians

There was no specialist in podiatry services or social workers. Therefore, there is a need for more high qualified diabetologists, podiatrists, specialist nurses on diabetes management particularly foot care, dieticians and health educators as well as psychologists or social workers.

There are five to six clinics opened daily in the centre (Sunday-Thursday, 8 am – 3 pm) which include three to four follow up clinics and one ophthalmology clinic. In addition, there are clinics which open one to two times per week. These include diabetes paediatric clinic, foot clinic, dietetic clinic and health education clinic.

The centre does not provide routine annual checkups or a specific programme for screening of diabetes complications. The follow-up period and the investigations carried out depend on the patient's condition.

The ADC does not provide the following services:

1. A programme for tight control of blood glucose and blood pressure for patients with diabetes.
2. Retinopathy screening for all patients with diabetes.
3. Foot screening for those at high risk.
4. Screening obese people for IGT
5. Multiple risk factor management programmes.
6. A structured patient self-care education programme.
7. Reduction of obesity and physical inactivity in high-risk groups.

Retinopathy and foot screening as well as referral to the dietetic clinic or the education clinic are done based on the clinical judgement of the treating physician.

### *5.4.3. Other healthcare services*

There is no tertiary or specialist hospital in Abha city. However, ACH can refer patients in need for advanced healthcare to King Fahad Medical City, King Fisal Specialist Hospital and Research Centre or King Khalid Eye Specialist Hospital in Riyadh.

A programme for home care services to the population of Aseer region is in its development and there were no data available yet regarding these services.

### *5.4.4. Service utilization and healthcare burden*

Data on deaths from diabetes were not available for Aseer region or Abha city. Data on diabetes morbidity and diabetes care were limited. The available data included: a description of the age group, gender and nationality of the registered population of each PHCC; the total number of registered patients with diabetes in each PHCC; the

total number of patients with diabetes who visited the PHCC; and their age group, gender and nationality. At secondary healthcare level, additional data were available on type of diabetes and type of complications each patient had.

### *Prevalence of diabetes in Abha:*

The number of people with diabetes in Abha city is increasing. In 2011, 251 patients were diagnosed with diabetes (Figure 19). The current registered prevalence of diabetes in all age groups in Abha is 3.75%. In the National Reference for Diabetes Mellitus Guidelines in Primary Health Care in Saudi Arabia, the Minister of Health reported a national prevalence of diabetes for all age groups to be 14%.[239] This would indicate that 73% (12988) of people with diabetes in Abha city are undiagnosed (Table 8).

**Figure 19: Number of registered patients with diabetes in Abha city in the preceding 12 months, 2011**

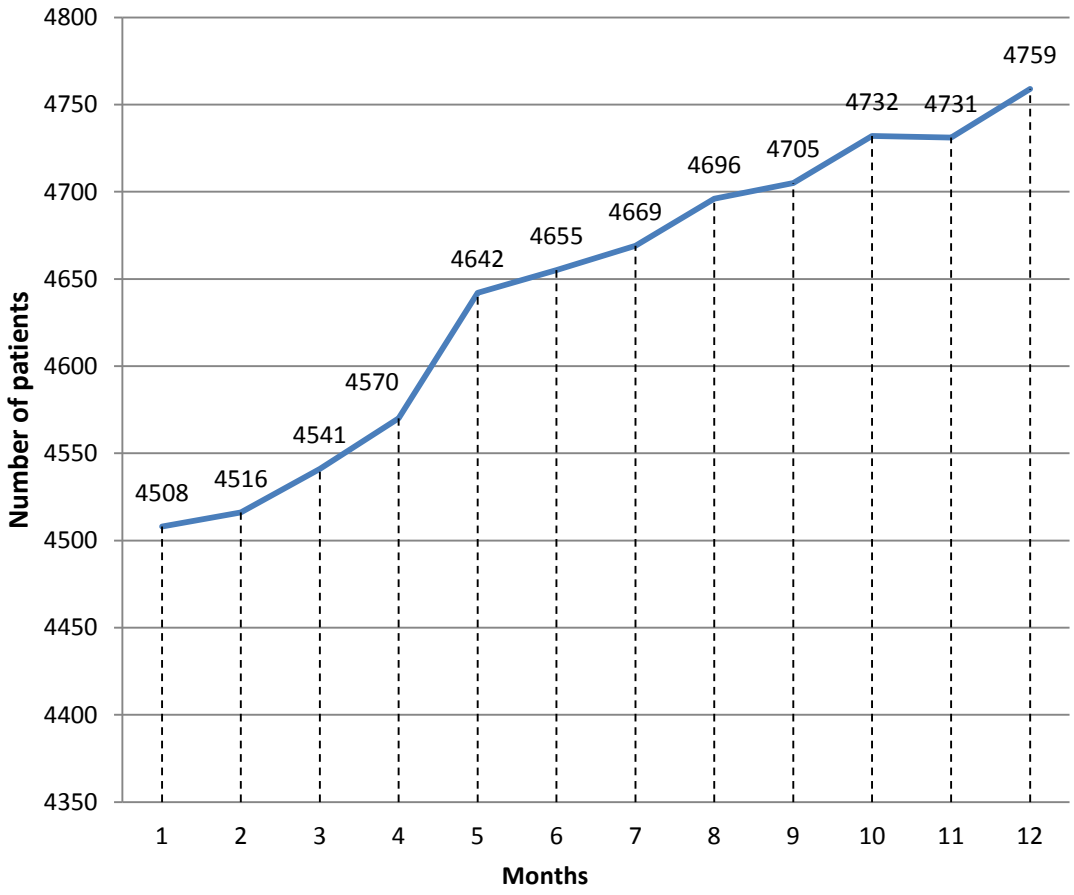


**Table 8: Number of diagnosed and undiagnosed people with diabetes in Abha city, 2011**

| PHCC | Total population | Number of registered people with diabetes | Prevalence (%) | Expected number of people with diabetes* | Number of undiagnosed people with diabetes | Percentage of undiagnosed patients |
|---|---|---|---|---|---|---|
| **Wasat Abha** | 20105 | 845 | 4.20 | 2814.7 | 1969.7 | 69.98 |
| **Almanhal** | 18593 | 726 | 3.90 | 2603 | 1877 | 72.11 |
| **Almowadafeen** | 19473 | 565 | 2.90 | 2726.2 | 2161.2 | 79.28 |
| **Almansak** | 9774 | 218 | 2.23 | 1368.4 | 1150.4 | 84.07 |
| **Sultan city** | 10015 | 509 | 5.08 | 1402.1 | 893.1 | 63.7 |
| **Johaan** | 1264 | 91 | 7.20 | 176.96 | 85.96 | 48.58 |
| **Alkaabel** | 14802 | 785 | 5.30 | 2072.3 | 1287.3 | 62.12 |
| **Alaziziah** | 7323 | 332 | 4.53 | 1025.2 | 693.22 | 67.62 |
| **Alnumais** | 17763 | 471 | 2.65 | 2486.8 | 2015.8 | 81.06 |
| **Therah** | 7655 | 217 | 2.83 | 1071.7 | 854.7 | 79.75 |
| **Total** | 126767 | 4759 | **3.75** | 17747 | 12988 | **73.18** |

* *Expected number of patients with diabetes was calculated based on the reported MOH national prevalence of diabetes in all age groups (14%).*

### *Visits of people with diabetes to healthcare services:*

The data on visits of patients with diabetes to Almansak PHCC were not recorded routinely. In 2011, the analysed routine data for the other PHCCs, ADC, AGH and ACH showed that there were 29917 visits for patients with diabetes to healthcare. As shown in Figure 20, 61.7% (18463) of these visits were to the PHCCs while 23% were to ADC and 9.4% were to the outpatient clinics of AGH.

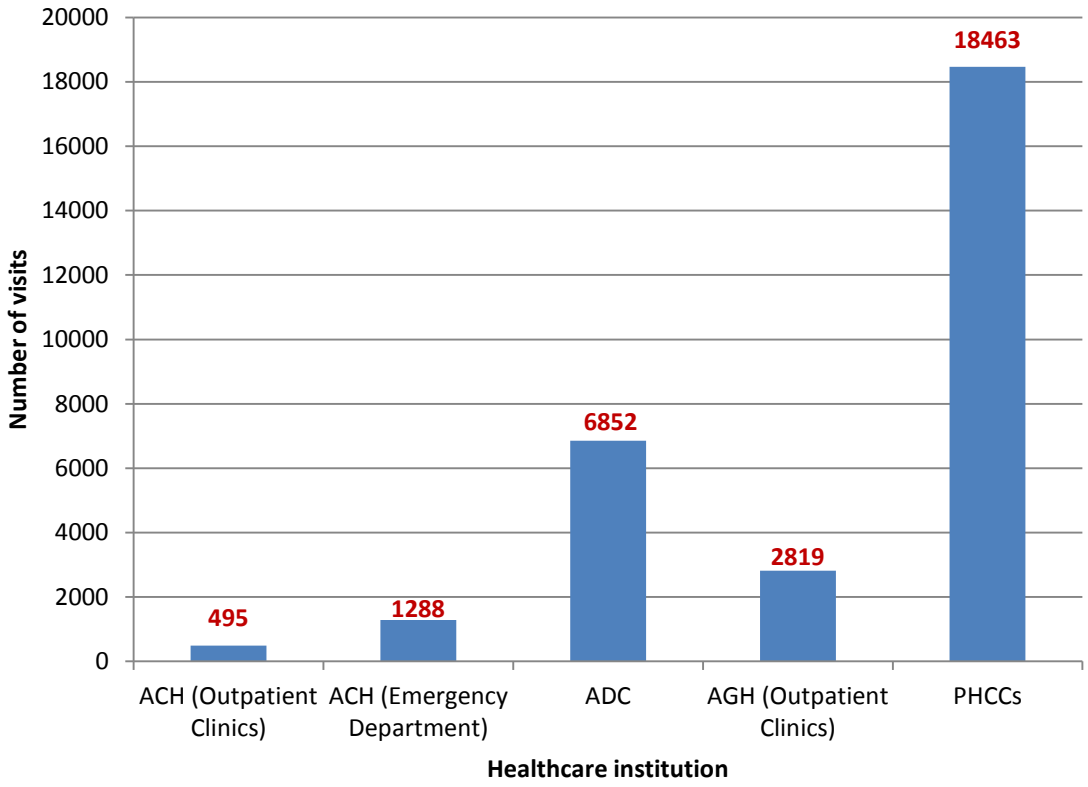
At the PHCCs, the ratio of the number of visits to the number of registered patients with diabetes would roughly show the variation in service provision between PHCCs. For example, Wasat Abha PHCC received or offered around 3 visits for each registered patient with diabetes per year while Therah PHCC offered 6 visits per year for each

registered patient with diabetes (Table 9). Of the total visitors with diabetes in 2011 to the PHCCs, 53.3% were male, 24.7% were aged between 15 to 44 years, 48% were between 45 to 59 years and 25% were 60 years or older. No data were collected routinely on the presence of complications among visitors at PHCCs.

**Table 9: Total number of visits of patients with diabetes to the PHCCs for the preceding 12 months, 2011**

| PHCCs | Total number of registered patients | Total number of visits | Visit: patient ratio |
|---|---|---|---|
| **Wasat Abha** | 845 | 2415 | 2.86 |
| **Almanhal** | 726 | 4250 | 5.85 |
| **Almowadafeen** | 565 | 3045 | 5.39 |
| **Almansak** | 218 | Not available | Not available |
| **Sultan city** | 509 | 1281 | 2.52 |
| **Johaan** | 91 | 275 | 3.02 |
| **Alkaabel** | 785 | 1948 | 2.48 |
| **Alaziziah** | 332 | 1357 | 4.09 |
| **Alnumais** | 471 | 2575 | 5.47 |
| **Therah** | 217 | 1317 | 6.07 |
| **Total** | **4759** | **18463** | **4.07** |

**Figure 20: Total number of visits of patients with diabetes to all healthcare institutions in the preceding 12 months, 2011**




At the secondary healthcare level in 2011, the outpatient clinics of ACH and AGH received more female visitors with diabetes (54%) than males; while the ADC and the emergency department of ACH received similar number of visits from male and female patients with diabetes (53.5% and 51.3% respectively). More than two thirds of the visitors to the outpatient clinics of ACH and AGH were aged 45 years or older (67.7% and 72% respectively). The children (< 15 years) with diabetes represent 12.4% of the visitors to ADC, 27% of the visitors to the ACH emergency department, 5.7% of the visitors to ACH outpatient clinics, and only 0.2% of the visitors to AGH outpatient clinics.

The data showed that 17.2% of the visitors to the AGH outpatient clinics and 9.6% of the visitors to ADC had chronic complications. No data were collected on presence of complications among the visitors to the ACH.

***Variation of visits over a 1-year period:***

Over a one year period, the variation in the total number of visits of patients with diabetes each month to the PHCCs, AGH outpatient clinics, ADC and ACH are shown in figures 21-25. At the PHCCs, AGH outpatient clinics and ADC, the lowest number of visits was consistently during month 9, the month of Ramadan. In contrast, the number of visits to the emergency department of ACH reached its peak in the same month of Ramadan (Figure 25).

Whether fewer appointments were offered during Ramadan or the patients did not attend their appointments, the end result was a sharp rise in the visits of patients with diabetes to the emergency department. This rise could also be attributed to the fasting during Ramadan in addition to delayed visits.

The majority of patients (92.5%) who visited the emergency department received the necessary treatment and were discharged in the same day (Figure 25).

**Figure 21: Total number of visits of patients with diabetes to the PHCCs each month for the preceding 12 months, 2011**

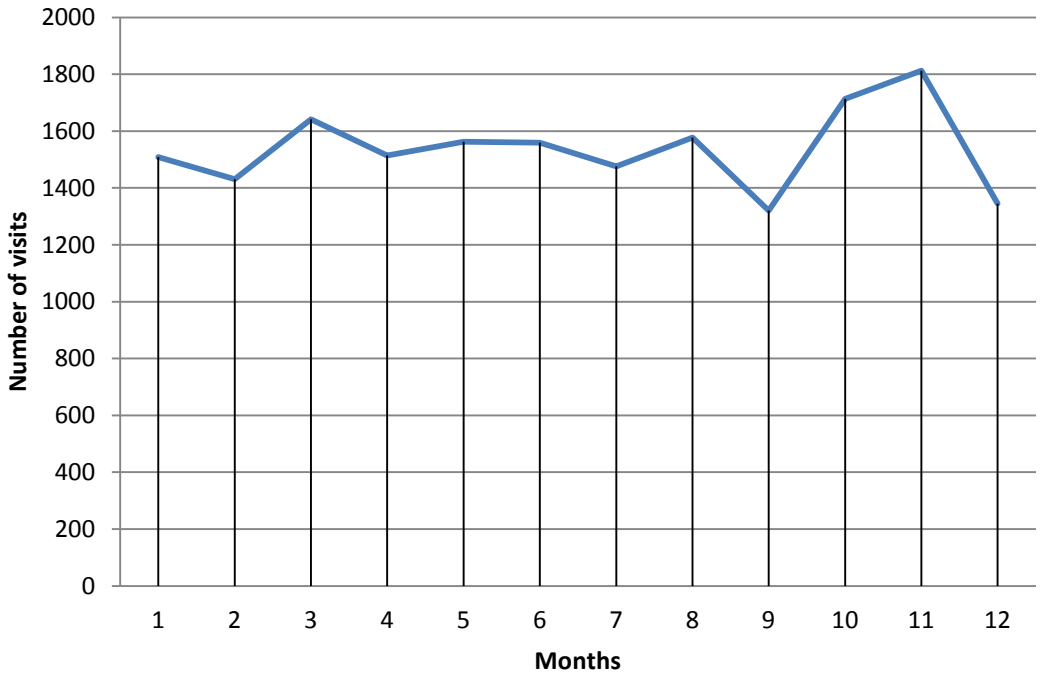
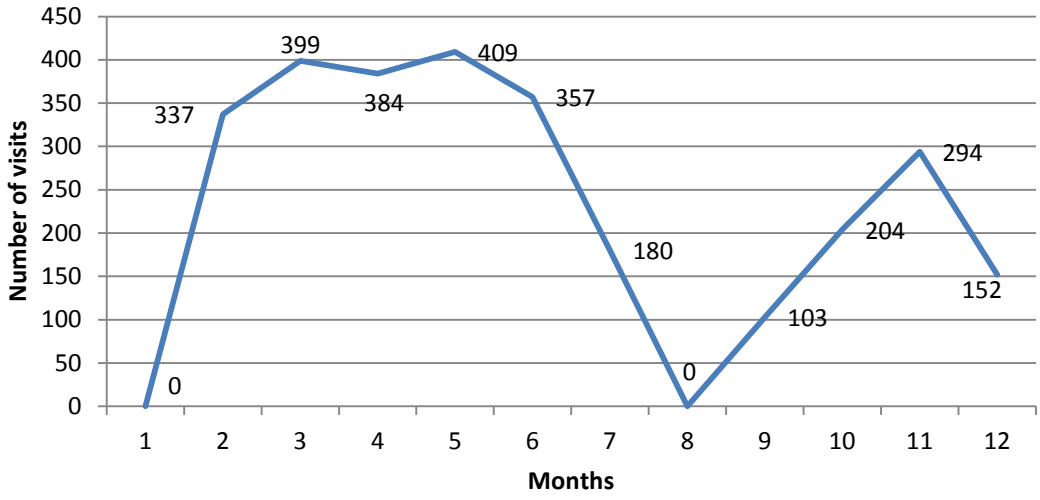



**Figure 22: Total number of visits of patients with diabetes to the AGH outpatient clinics each month for the preceding 12 months, 2011***




**The clinic was closed at months 1 and 8.*

**Figure 23: Total number of visits of patients with diabetes to the ADC each month for the preceding 12 months, 2011**

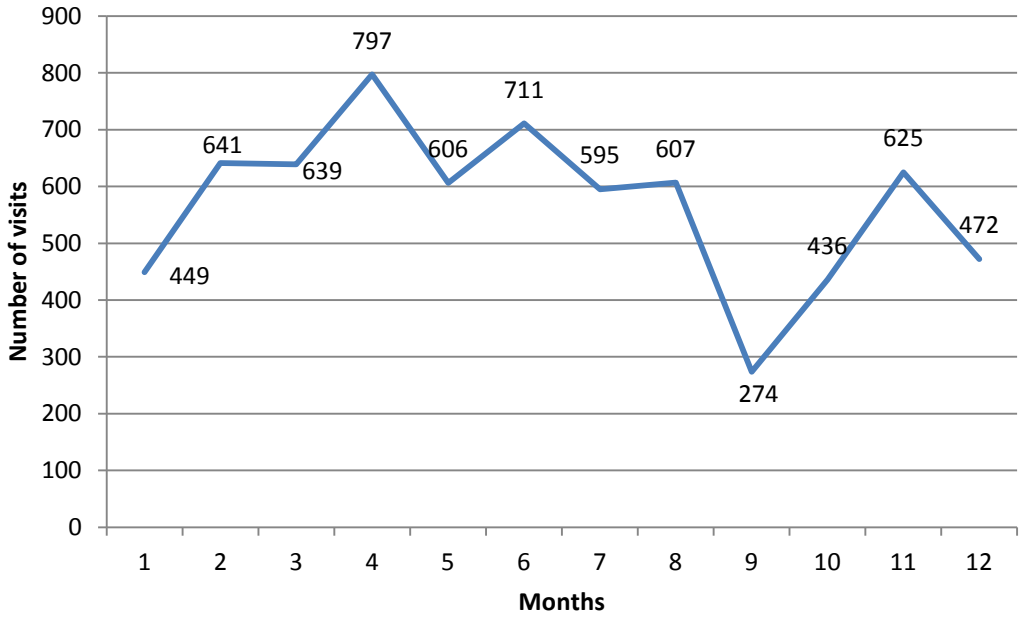



**Figure 24: Number of visits of patients with diabetes to ACH outpatient clinics in the preceding 12 months, 2011**

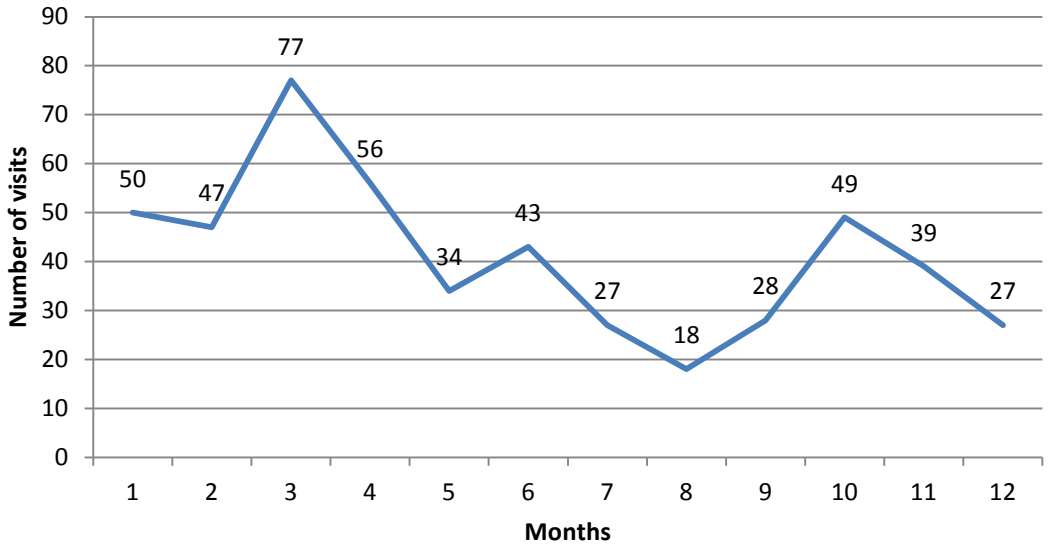
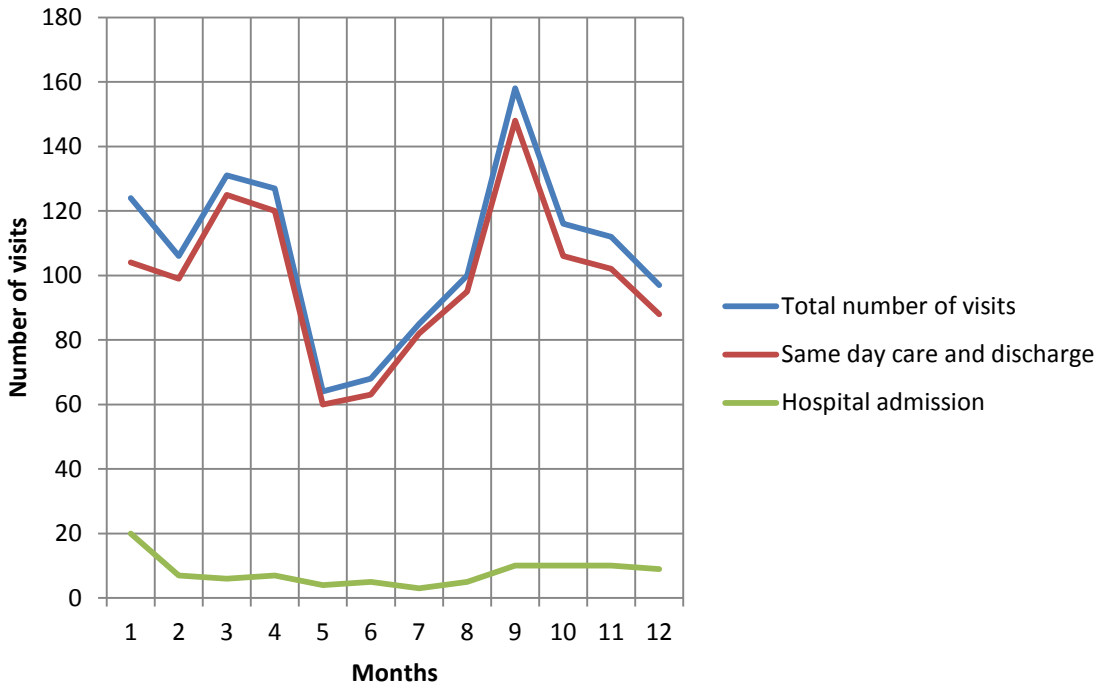


**Figure 25: Number of visits of patients with diabetes to ACH emergency department in the preceding 12 months, 2011**



## 5.5. Discussion

This review of existing resources, available routine data and interviews with key personnel shows that gaps exist between recommended diabetes care and the care patients actually receive. Several gaps in diabetes care service provision at both the primary and secondary healthcare level were identified. These gaps will be discussed in the following paragraphs for each component of diabetes care.

A comprehensive diabetes service should provide the following components of diabetes care: primary and secondary prevention of T2DM; diagnosis; initial management; education for self-management; ongoing management; and regular screening for and treatment of complications. These components of diabetes services should be organized and delivered in a collaborative and coordinated way using an effective and efficient integrated approach. However, the current evidence for the most effective and efficient approach to organizing the inherently complex diabetes care is weak.[19]

### 5.5.1. *Gaps in prevention*

***Primary prevention:***

There were no specific interventions that targeted people at risk of developing diabetes with the specific aim of preventing diabetes. However, a health promotion initiative was implemented in some of the PHCCs of Abha city. The attendees of the health promotion clinics were offered counselling, history taking, clinical examination, health education and screening tests according to their age group and the

recommendations of the relevant guidelines.[240] Among 429 patients who attended the clinic in 2009, 98% had imbalanced diet, 99% were inactive, 28% were overweight and 46% were obese, one fifth (21%) were found to have pre-diabetes (FBG: 100-125 mg/dl, 5.6-6.9 mmol/l) and 3% were confirmed as having diabetes.[240] Most of the participants had three or more risk factors for coronary heart diseases (73% among males and 69% among females). All the attendees were counselled about the need for a well balanced diet and physical activities. Individuals who needed further care were referred to the chronic diseases mini-clinics for management and follow-up.

The Gulf Executive Plan for Control of Diabetes, which was not available in any of the PHCCs, recommended 3 strategies for primary prevention of T2DM which are:

1. Raising health awareness about diabetes risk factors
2. Encouraging healthy nutrition and physical activities
3. Setting regulations which help reducing risk factors (e.g. labelling foods...)[215]

The mechanisms of achieving these strategies need to be properly implemented at the national and local levels. Several campaigns are conducted about diabetes and its risk factors every year in Abha by the PHCCs and ADC.

There is a need to support and expand the health promotion initiative to cover all the PHCCs in Abha city. Specific programmes within this initiative to tackle obesity, promote exercise and healthy eating should be developed and implemented. However, there is a need first to develop national or local guidelines and strategies for promoting health, particularly for physical activities and healthy eating. Tackling the underlying determinants of T2DM in Saudi Arabia and making our environment less obesogenic is

a great challenge that will require a broad range of policy measures across multiple sectors. Multiple risk factor management programmes have been shown to be effective in some developed countries.[237] These programmes need to be considered in planning for prevention of T2DM in our primary healthcare system.

***Secondary prevention:***

One of the components of the mini-clinic programme is to identify those at risk of diabetes and screen them periodically according the relevant guidelines.[201] However, this component of the programme seems to be poorly implemented due to the low prevalence of diabetes in Abha when compared to the national figure. The routine data showed that 200 to 400 patients are diagnosed with diabetes every year in Abha.

The Gulf Executive Plan for Control of Diabetes recommended 2 strategies for secondary prevention of T2DM which are:

1. Early detection of T2DM among high risk groups
2. Providing care to healthy people to reduce the risk factors of diabetes

The screening of those at risk of having diabetes is part of the mini-clinic programme and the health promotion clinics initiative in PHCCs. This can partially meet the requirements of the gulf executive plan for secondary prevention of T2DM. Several studies have reviewed the effectiveness and cost-effectiveness of screening for T2DM.[241-243] However, the reviewed evidence by IDF showed that targeting those at high risk is at best likely to have a moderate impact on the prevalence of T2DM.[37]

Additional support and efficient implementation might increase the effectiveness of these screening programmes. However, there is a need for studies to evaluate the effectiveness and cost-effectiveness of these programmes in real world settings in Saudi Arabia. These gaps in primary and secondary prevention of T2DM need to be addressed by the MOH.

***Tertiary prevention:***

There are no specific programmes for tight control of blood glucose and blood pressure for patients with diabetes. Also, there is no separate programme for retinopathy screening for all patients with diabetes, or foot screening for those at high risk. Although it was obvious that controlling blood glucose, blood pressure and blood lipids are one of the aims of the mini-clinics programme and the Gulf Executive Plan for Control of Diabetes, it did not include programmes for tight control of blood glucose and blood pressure for patients with diabetes. However, one of the components of the mini-clinics programme is to annually screen at hospital all patients with diabetes for retinopathy, nephropathy and foot problems. In spite of that, the implementation of these screening tests is inadequate and needs to be improved.

Therefore, it might be better to review how existing programmes can be better delivered and what the causes of poor implementation are. In addition, providing programmes for tight control of blood glucose and blood pressure within the mini clinics programme should be included.

### 5.5.2. *Gaps in diagnosis and initial management*

Diabetes can be initially diagnosed in primary health care. Then the patients should be referred to hospital to confirm diagnosis and plan for treatment. The current referral system usually uses the patient as a postman between the PHCCs and the hospital. This method of communication between the PHCCs and the hospital causes many problems to the referral and feedback system. Some patients might lose the referral or feedback sheets and then decide not to go to the hospital or bring the feedback to the PHCC. Other patients might just decide not to go and throw the papers away. There is a need to review the current system of referral and feedback and to develop rules and guidelines that explain in detail the processes and steps of successful referral and feedback.

In the absence of an electronic recall system, it is difficult to trace each referral. Having an electronic healthcare system would not only facilitate the provision of healthcare and the communication between the different levels of healthcare, but it would also help to easily monitor and audit the healthcare services provided.

### 5.5.3. *Gaps in education for self-management*

One of the components of the mini clinics programme is to educate patients about a specific list of topics. Brief guidelines for educating people with diabetes were listed in the quality assurance manual.[200] This list of topics and these brief guidelines need to be more structured and comprehensive. The consultative section on diabetes education of the International Diabetes Federation has published:

First: "International standards for Diabetes Education",[205] which designed standards for structure, process and outcome for diabetes education that can be measured at basic and optimal level.

Second: "International Curriculum for Diabetes Health Professional Education"[244] which provides a curriculum framework to assist organizations to prepare education programmes for diabetes educators.

These references in addition to "the national reference for educating people with diabetes in Saudi Arabia"[245] should be used to design a diabetes education programme that can help patients to develop their skills, knowledge and confidence to make informed decisions and self-manage their diabetes.

### 5.5.4. *Gaps in routine ongoing diabetes management*

Routine diabetes care is provided mainly in the PHCCs. The mini clinics programme for diabetes in the PHCCs improved the process and outcomes of diabetes care.[246] In ADC, there was no specific programme or guidelines for the provision of routine care for patients with diabetes. The organization of the annual review for patients and screening for diabetes complications was not obvious. These gaps in service provision should be addressed by the MOH.

### 5.5.5. *Gaps in care policy, planning and organization*

There is a need to develop or update several national policy statements in order to improve diabetes care in Saudi Arabia. A National Service Framework which

determines specific standards and strategies for delivering diabetes care needs to be developed to drive up service quality and tackle variations in care. The current quality assurance in primary health care needs to be updated particularly after the implementation of the mini clinic programmes. The Gulf Executive Plan for Control of Diabetes was a very important and comprehensive executive plan. However, it needs to be available to all the medical directors of PHCCs and hospitals. Also, each country needs to translate the broad targets and strategies into specific actions and interventions that suit the system and resources of that country. The new national clinical practice guideline for diabetes management in primary healthcare needs to be available in all the PHCCs and needs to be implemented.

### 5.5.6. *Gaps in working staff*

The national average ratio for *population: physician ratio* is 3364: 1. Only Wasat Abha was above this ratio. Therefore, there is a need for more physicians in Wasat Abha PHCC. Most of the working physicians did not have postgraduate training. Therefore, providing continuous professional education and training courses is important to improve the quality of care. The number of lab technicians and x-ray technicians need to be increased. In AGH outpatient clinics, there is a need for more physicians to ensure continuous cover for the diabetes clinic.

### 5.5.7. *Gaps in resources*

Governmental buildings are needed for the PHCCs that are currently in rented houses. Most of diabetes care in Abha city is delivered in primary care. Therefore, it is

important to give much more resources to PHCCs in order to improve the quality of diabetes care in Abha city.

The expected increase in total population, middle and old aged population and number of patients with diabetes should be considered in the planning for service provision in the future.

### 5.5.8. *Limitations*

In this chapter, three research methods were used, each of which has its own strengths and limitations. The first one, which was by inspecting the actual physical facilities in which care is provided using a standard checklist, is generally considered as a gold standard method.[225] In this study, the observers assessed only whether specific resources are available in the PHCCs but they did not assess the adequacy of required supplies, amount, type, or condition of equipment. This was one of the limitations of the checklist used; another was the inability to confirm the proper use of available resources.

In addition, the scoring system which was developed for the checklist was not tested for reliability and validity of measuring the degree of completeness of clinic's resources. However, when the findings of this scoring system were triangulated with the findings of the case notes review, which will be presented in the next chapter, they both showed consistent findings. The best resourced PHCCs according to this scoring system were also best PHCCs at implementing the process measures of diabetes care (Almanhal, Almansak, Almowadafeen, and Alnumais).The consistency between the

findings suggested that the assessment and scoring methods are valid. However, this simple scoring system needs to be tested to determine accurately its important items for high quality diabetes care and its usefulness in predicting the clinical outcomes.

The second method was by using the purposive sampling technique to identify and interview 16 lead clinicians. This method of sampling was particularly useful in this evaluation research. It involved identifying who the major stakeholders are by selecting those who are involved in designing, giving or administering the diabetes services. This group of stakeholders are best placed to answer the research questions.

The structured questionnaires asked whether strategies and policies are available for diabetes care and whether some specific services are delivered for patients with diabetes. The face to face interviews gave the researcher the chance to give more explanation to make sure the questions were appropriately understood and the correct answers were obtained. However, there is still possible that some answers were biased. Some interviewees might perceive that underestimating what is available would bring more resources. On the other hand, some may perceive that overestimating what is available would show that they are running a high quality service. This would occur if the lead clinicians thought they will be held responsible for any deficiency reported. In reality, it was difficult to know if response bias was a problem.

The third method was by collecting and analysing routine data on diabetes prevalence, complications and service utilization. Evaluating healthcare using routine data is now a common approach, particularly after the increasing availability and use of computerized datasets. However, its accuracy has been regularly questioned, with concerns including the completeness of registration and the accuracy of coding and recording.[238] The collected routine data were of unknown validity as its accuracy has not been assessed in published research. Therefore, care must be taken in the interpretation of the findings.

This study found several instances of these limitations. For example, the number of visits of patients with diabetes to Almansak PHCC was missed due to incomplete recording (Table 9). In addition, misclassification or under recognition of diabetes complications is possible, particularly in hospital. It was expected that the patients with diabetes who visited the hospitals would have more complications than those who visited the PHCCs. But, the collected routine data reported lower proportions of diabetes complications among patients with diabetes who visited AGH and ADC (17.2% and 9.6% respectively) when checked against the records of patients in the PHCCs, which showed higher proportion of diabetes complications (32%), (See: next chapter). This would raise concerns about how accurate and complete the complications are coded and recorded in hospitals.

A strength of this study is that the routine data were checked (triangulated) against other sources of data in this thesis, they showed similar findings. For example, the data on registered diabetes prevalence were similar to what has been reported by the structured questionnaire to the medical directors and the case notes reviewed (See:

next chapter). Insufficient medications, staff, laboratory resources and health education resources were also reported or identified by other research methods used in this thesis. These consistent findings will be discussed in the next chapters and triangulated in the final chapter.

Despite these disadvantages, routine data are often used regardless of lack of completeness and inaccuracies.[247] They can be cost-effective and can make a useful contribution.[199] It is relatively cheap to use, comprehensive, regularly updated and quick to obtain, particularly if computerized.[227, 247] Therefore, these types of data are used officially by higher authorities of the MOH.

## 5.6. Conclusion

The current provision of diabetes care services in Abha city is inadequate. Several gaps in service provision were identified. None of the 10 diabetes mini-clinics were completely equipped. The buildings of 7 PHCCs were rented private houses. There was no laboratory or dental clinic in one of the PHCCs. Insufficient and inconsistent distribution of some healthcare professions was identified. There is a need for electronic healthcare system and electronic databases to facilitate care organization, provision and auditing. Explicit policy statements, strategies, action plans and care guidelines are needed to organize diabetes care and achieve greater consistency in the availability of care services and resources. In order to achieve high quality diabetes care, these gaps should be addressed. Then continued evaluation and audit of diabetes services should be implemented periodically to ensure high quality and effectiveness.

# CHAPTER SIX

# Case note reviews

*This chapter discusses the methods and results of the case note review. Demographic and clinical characteristics of people with diabetes in Abha city are presented. In addition, the process and outcome measures of diabetes care are discussed.*

# Chapter 6: Case note reviews

## 6.1. Introduction

Patients' health records play an important role in modern healthcare systems. Healthcare records contain important information about patients which usually include both personal and clinical information. The records also contain information on the previous medical history, treatment received, laboratory test results and relevant lifestyle information. Therefore, health records and case notes are a commonly used and valuable source of data for audit and scientific research.[217, 238] However, they have several limitations. For example, the case notes are not always available and accessible, some case notes might not contain all the data required for a research study, some pieces of data are not consistently recorded and sometimes it is difficult to identify the case notes of particular types of patients such as patients with diabetes.[217, 238]

In spite of all of these limitations, reviewing patients' case notes is by far the most widely applied method to assess some aspects of healthcare such as the occurrence of adverse healthcare events in hospitals,[248] Moreover, electronic medical records are increasingly seen as a potentially comprehensive source of data on the process and outcome measures of healthcare.[249]

In Abha city, all the healthcare records are in form of paper and handwritten records. The Regional Health Affairs (RHA) in Aseer region, in 2007, tried to transform the

traditional healthcare system in primary healthcare into electronic information system including electronic medical records. However, several difficulties were faced and the attempt failed.

## 6.2. Objectives

The aim of this chapter was to abstract specific data from the case notes of all patients with diabetes at the PHCCs and from a sample of patients who are registered in the Asser Diabetes Centre (ADC). The objectives were first to describe the people with diabetes in terms of their demographic and clinical characteristics. Secondly, to assess to what extent healthcare providers implemented the key process measures of diabetes care. Thirdly to assess to what extent the outcome targets of diabetes care were achieved.

## 6.3. Methods

### *6.3.1. Designing stage*

Prior to designing the study data collection forms, decisions were to be made on what categories of information and type of data are relevant to the study objectives and need to be collected. To determine and categorize the required information, several steps were taken. The first step reviewed international diabetes management guidelines[8, 203-205, 250], authoritative reports on diabetes care organization and evaluation in Scotland[207-212, 251-252] as well as the previous research on diabetes and its management in Saudi Arabia (chapter 1). The second step focused on exploring the

current system of diabetes care in Saudi Arabia. Several studies, reports and guidelines were reviewed including the national quality assurance protocol in primary health care and the diabetes mini-clinic manuals (chapter 5).[200-202, 216, 231, 253-254] This step helped to identify the types of care programmes which are provided in Abha and the current standards of diabetes care at the local and national levels. This gave an indication of the range and types of data that can be collected on the assessment of diabetes care. The final step was to determine whether specific data could be gathered from the patient records. Thus, a copy of the records of patients with diabetes at the PHCCs was obtained and reviewed to identify the type of data that are available in these records. Finally, the data items that can be collected from patients' records were converted into easily understandable and answerable questions. These questions were then gathered and ordered to generate an initial data collection form in order to collect specific data from the records of patients with diabetes at the PHCCs.

Appendix 10 shows the first data collection form that was designed to collect data from the patient's records in the PHCCs. This data collection form was divided into five categories. The first category was about patient's demographics and bio-data. This category was divided into 3 sub-categories (A, B, and C). Sub-category A collected demographic data such as age, gender, education and marital status. Sub-category B gathered information about the clinical characteristics of each patient such as height, weight, blood pressure, and fasting blood glucose. Sub-category C was for evaluating what each patient is currently treated with, the degree of patient's compliance with diet, exercise, follow-up appointments and drugs. It also included recording the number of follow-up visits and referral to hospitals for annual review. The second

category was used to evaluate the quality of recording of patient's information, investigations and examination results. The third category was solely for identifying patients with diabetes complications. The fourth one was to assess the degree of implementing the health education programme for each patient. The final category was devoted for evaluating the annual review of patients.

### *6.3.2. Piloting stage*

Three researchers tested the data collection form for its feasibility, question wording, order, range of answer options and deciding on a coding scheme. The form was piloted at Almanhal PHCC by three researchers (AA, YA and LO). The researchers reviewed 15 records and several required changes were identified. For example, the question that asks about the ethnic groups was deleted because patients' records do not include information regarding ethnicity. Moreover, two additional options which are (illiterate and read-write) were added to the answer options of the question about education because many patients were illiterate. Also, the answer options for the question about the type of the current treatments were changed from a list of three options (Diet+exercise only, oral antidiabetic, or insulin) into a broad list of many drugs which are used for treating diabetes. Other drugs that are recommended to be used in treating diabetes complications such as ACEIs, ARBs, aspirin and statins were also added to the list. These drugs are recommended to be available in each PHCC according to the MOH essential drug list. In addition, more questions were added to record the results of the annual investigations and examinations such as HbA1c,

creatinine and cholesterol levels. Moreover, each section in the form was modified to fit easily for collecting quickly the available information from the patients' records.

***ADC's form:***

Because the records of patients in ADC might be different from PHCCs' records, the form was piloted again at the ADC by three researchers (AA, MA and LO). The researchers reviewed 15 records and found that several modifications were needed in order to collect the required data from the records of ADC. Therefore, a separate form was designed specifically for collecting data from the records of ADC (Appendix 11). In this form, the information categories/sections were similar to that of PHCC's form but some sections were slightly modified. For example, a question was added to the first section about the past history of diabetes complications. The questions about level of education and marital status were deleted because the ADCs' records do not routinely record this information. Moreover, the questions about the annual referral and patient's compliance were deleted since there is no need for referral at ADC and the compliance was not recorded routinely. The number and format of record's sheets at ADC were different from those at the PHCCs, therefore, the names and numbers of the ADC record's sheets in the second section were modified accordingly. The third section of both forms was similar; however, the fourth one was modified by reorganizing the education programme checklist to fit the ADC records.

### *6.3.3. Methods of administration and collection*

***PHCCs:***

In each PHCC, two to three nurses from the project team who were interested in diabetes or working in the diabetes mini clinic reviewed all the records of patients with diabetes and filled one form per patient. The members of the supervision team visited each PHCC and trained the nurses on how to fill in the form properly. The specific number of the required forms for each centre were printed, delivered and later collected by the main researcher. At the beginning, the main researcher and the supervision teams double checked the completed forms to ensure the data are extracted accurately and completely. At this stage many forms were returned, for second review, to the working teams due to inaccurate or missed information. In addition, further training and discussion were conducted with the members of the working teams by the researcher to ensure accurate and correct data extraction. After two weeks, the nurses were able to fill in the forms accurately; therefore, then only a random sample of 5-10 % of forms were regularly reviewed to check for accuracy and completeness.

***ADC:***

At ADC, the total number of patient's records was more than 5000 records. Due to resources and time limitations, we decided to review only 10% sample of these. As the records were stored in a different department (Aseer central hospital records department), full access to these records was difficult. Therefore, it was not possible to get a random sample of these records. Instead, each day for 7 weeks, when the

records of those patients who had appointments transferred to the ADC clinics, 3 nurses reviewed the records of those patients who were living in Abha city.

### *6.3.4. Methods of analysis*

The data were first entered into the Epi Info software (version 7) which helped to create a simple digital data collection form that allowed for rapid and accurate data entry. Two data entry clerks were employed to enter the data from the paper forms into the Epi info Form. The researcher (AA) then reviewed manually about 200 forms at the beginning of data entry to eliminate any errors and check the accuracy and completeness of entered data. A random sample, of about 10 per 100 forms, was then checked regularly by the researcher (AA) to make sure the data were entered in an accurate and complete manner. They were later transferred to SPSS Statistics version 20 to perform the statistical analysis. In addition, the charts and figures were produced using the Excel software 2007.

The case records of non-nationals were excluded from this review. This decision was taken for several reasons. First, the non-national population are a heterogeneous group of people which consists of many nationalities and ethnic groups. In addition, they are mostly people who go to Saudi Arabia to work. Thus, the majority are young and healthy. These factors might confuse our results and obscure the health status of the Saudi national people.

A detailed analysis of the case records of the PHCCs and the ADC was carried out separately. Descriptive statistics and frequency tables were generated for questions on

demographic characteristics and related process and outcome measures of diabetes care. The glycemic control among patients with diabetes was evaluated and described using the most recent readings of the fasting blood glucose (FBG) instead of HbA1c. This was because very few patients have had a record for HbA1c test. In order to assess the glycemic control as accurately as possible, the mean of the most recent readings of the FBG within the preceding 12 months was used for each patient instead of the reading of the last occasion.

## 6.4. Results

The total number of registered Saudi patients with diabetes in the 10 PHCCs of Abha city is 4583 patients. More than 97% (4458) of their medical records were reviewed. At ADC, there were 5023 registered patients with diabetes. A total of 551 (11%) case notes were reviewed. The results for both the PHCCs and ADC case notes analyses will be presented separately. The first set of analyses explores the demographic characteristics of the people with diabetes in Abha city. Then, key process measures of diabetes care will be described such as diabetes therapy, follow-up care, annual review and health education. Finally, key outcome measures of diabetes care such as the indictors of glycemic control and obesity will be described in addition to the prevalence of diabetes complications.

### *6.4.1. Demographics of diabetes in Abha city*

***PHCCs:***

Table 10 shows that more than 85% of the people with diabetes in Abha city were over age of 45 years. More than 40% of the patients were illiterate and more than 47% were unemployed.

Table 10: Demographics of patients with diabetes in Abha city, Saudi Arabia

| Variable | Number | Percentage |
|---|---|---|
| ***PHCCs*** | | |
| Almanhal | 668 | 15.0 |
| Wasat Abha | 796 | 17.9 |
| Almansak | 208 | 4.7 |
| Almowadafeen | 527 | 11.8 |
| Johaan | 83 | 1.9 |
| Sultan City | 498 | 11.2 |
| Alkaabel | 700 | 15.7 |
| Alaziziah | 314 | 7.0 |
| Therah | 204 | 4.6 |
| Alnumais | 460 | 10.3 |
| Total | 4458 | 100 |
| ***Age Categories*** | | |
| Children ≤ 14 Y | 30 | 0.7 |
| Youth (15-24 Y) | 113 | 2.5 |
| Adults (25-44 Y) | 486 | 10.9 |
| Middle Age (45-64 Y) | 2284 | 51.3 |
| Older people (≥ 65 Y) | 1528 | 34.6 |
| Missed | 16 | 0.4 |
| Total | 4458 | 100 |
| ***Gender*** | | |
| Male | 2288 | 51.3 |
| Female | 2077 | 46.6 |
| Missed | 93 | 2.1 |
| Total | 4458 | 100 |
| ***Occupation*** | | |
| Retired | 1121 | 25.1 |
| Unemployed | 2130 | 47.8 |
| Employed | 983 | 22.1 |
| Irregular work | 78 | 1.7 |
| Missed | 146 | 3.3 |
| Total | 4458 | 100 |
| ***Education Level*** | | |
| Illiterate | 1804 | 40.5 |
| Read & write | 410 | 9.2 |
| Secondary school level or lower | 1385 | 31.1 |
| University level (Bachelor) or above | 495 | 11.1 |
| Missed | 364 | 8.2 |
| Total | 4458 | 100 |
| ***Smoking status*** | | |
| Smoker | 219 | 4.9 |
| X-smoker | 53 | 1.2 |
| Non-smoker | 3940 | 88.4 |
| Missed | 246 | 5.5 |
| Total | 4458 | 100 |

| | | |
|---|---|---|
| ***Marital status*** | | |
| Single | 242 | 5.4 |
| Married | 3840 | 86.1 |
| Divorced | 51 | 1.1 |
| Widowed | 227 | 5.1 |
| Other | 4 | 0.1 |
| Missed | 94 | 2.1 |
| Total | 4458 | 100 |

The majority of illiterate patients (80%) and those unemployed (87%) were females (Table 11). For males, 47% had at least a primary or secondary school education and almost 17% had a bachelor degree. Forty four percent of male patients were retired and 37% were employed. The mean age for all was 58.26 ± 14.7 years and the mean diabetes duration was 9.25 ± 6.6 years. Only around 5% were smokers and the majority (86%) was married. The patients mostly (83%) had T2DM and almost 74% were either overweight (28.4%) or obese (45.3%). Body mass index (BMI) is significantly associated with gender among patients with diabetes. Overweight was more common among males than females (35.5% versus 20.6), however, the proportion of obesity among females (61.6%) was double of that among males (31%), (Table 11), ($\chi^2$=449.7, df=5, P < 0.001) (OR=3.7, 95% CI: 3.26-4.26, P < 0.0005).

Comparison between T1DM and T2DM patients' characteristics are shown in table 12. Of patients with T2DM, 90% were aged 45 years or older, 43% were illiterate and more than 76% were either overweight or obese. Of patients with T1DM, 53.7% were aged 45 years or older, 23.7% were illiterate, and 56.8% were either overweight or obese.

**Table 11: Characteristics of male and female patients with diabetes**

| | | Gender | | | | |
|---|---|---|---|---|---|---|
| | | Male | % (/2288) | Female | % (/2077) | Missed |
| ***Occupation*** | | | | | | |
| Retired | | 1015 | 44.4 | 77 | 3.7 | 29 |
| Unemployed | | 238 | 10.4 | 1855 | 89.3 | 37 |
| Employed | | 846 | 37.0 | 115 | 5.5 | 22 |
| Irregular work | | 65 | 2.8 | 12 | 0.6 | 1 |
| Missed | | 124 | 5.4 | 18 | 0.9 | 4 |
| Total | | 2288 | 100 | 2077 | 100 | 93 |
| ***Education Level*** | | | | | | |
| Illiterate | | 304 | 13.3 | 1458 | 70.2 | 42 |
| Read & write | | 253 | 11.1 | 151 | 7.3 | 6 |
| Secondary school level or lower | | 1075 | 47.0 | 283 | 13.6 | 27 |
| University level (Bachelor) | | 387 | 16.9 | 91 | 4.4 | 8 |
| Postgraduate levels | | 8 | 0.3 | 0 | 0.0 | 1 |
| Missed | | 261 | 11.4 | 94 | 4.5 | 9 |
| Total | | 2288 | 100 | 2077 | 100 | 93 |
| ***Smoking status*** | | | | | | |
| Smoker | | 209 | 9.1 | 2 | 0.1 | 8 |
| X-smoker | | 43 | 1.9 | 9 | .4 | 1 |
| Non-smoker | | 1875 | 81.9 | 1983 | 95.5 | 82 |
| Missed | | 161 | 7.0 | 83 | 4.0 | 2 |
| Total | | 2288 | 100 | 2077 | 100 | 93 |
| ***Marital status*** | | | | | | |
| Single | | 134 | 5.9 | 102 | 4.9 | 6 |
| Married | | 2060 | 90.0 | 1706 | 82.1 | 74 |
| Divorced | | 23 | 1.0 | 25 | 1.2 | 3 |
| Widowed | | 2 | 0.1 | 218 | 10.5 | 7 |
| Other | | 3 | 0.1 | 1 | 0.0 | 0 |
| Missed | | 66 | 2.9 | 25 | 1.2 | 3 |
| Total | | 2288 | 100 | 2077 | 100 | 93 |
| ***Type of diabetes*** | | | | | | |
| T1DM | | 313 | 13.7 | 241 | 11.6 | 12 |
| T2DM | | 1887 | 82.5 | 1748 | 84.2 | 76 |
| GDM | | 0 | 0.0 | 8 | 0.4 | 0 |
| Other | | 7 | 0.3 | 10 | 0.5 | 0 |
| Missed | | 81 | 3.5 | 70 | 3.4 | 5 |
| Total | | 2288 | 100 | 2077 | 100 | 93 |
| ***BMI class*** | | | | | | |
| Underweight | <18.49 kg/m$^2$ | 32 | 1.4 | 12 | 0.6 | 2 |
| Normal | 18.5-24.99 kg/m$^2$ | 365 | 16.0 | 146 | 7.0 | 6 |
| Overweight | 25-29.99 kg/m$^2$ | 812 | 35.5 | 427 | 20.6 | 29 |
| Obese I | 30-34.99 kg/m$^2$ | 501 | 21.9 | 657 | 31.6 | 14 |
| Obese II | 35-39.99 kg/m$^2$ | 138 | 6.0 | 405 | 19.5 | 10 |
| Obese III | ≥ 40 kg/m$^2$ | 71 | 3.1 | 219 | 10.5 | 5 |
| Missed | | 369 | 16.1 | 211 | 10.2 | 27 |
| Total | | 2288 | 100 | 2077 | 100 | 93 |

## Table 12: Characteristics of T1DM and T2DM patients in Abha city

| | | Type of diabetes | | | |
|---|---|---|---|---|---|
| | | T1DM | | T2DM | |
| | | Number | % (/566) | Number | % (/3711) |
| **Age Categories** | | | | | |
| Children ≤ 14 Y | | 29 | 5.1 | 1 | 0.0 |
| Youth (15-24 Y) | | 104 | 18.4 | 5 | 0.1 |
| Adults (25-44 Y) | | 129 | 22.8 | 341 | 9.2 |
| Middle Age (45-64 Y) | | 178 | 31.4 | 1998 | 53.8 |
| Older people (≥ 65 Y) | | 126 | 22.3 | 1352 | 36.4 |
| Missed | | 0 | 0.0 | 14 | 0.4 |
| Total | | 566 | 100 | 3711 | 100.0 |
| **Gender** | | | | | |
| Male | | 313 | 55.3 | 1887 | 50.8 |
| Female | | 241 | 42.6 | 1748 | 47.1 |
| Missed | | 12 | 2.1 | 76 | 2.0 |
| Total | | 566 | 100 | 3711 | 100 |
| **Occupation** | | | | | |
| Retired | | 89 | 15.7 | 992 | 26.7 |
| Unemployed | | 294 | 51.9 | 1753 | 47.2 |
| Employed | | 135 | 23.9 | 805 | 21.7 |
| Irregular work | | 16 | 2.8 | 60 | 1.6 |
| Missed | | 32 | 5.7 | 101 | 2.7 |
| Total | | 566 | 100 | 3711 | 100 |
| **Education Level** | | | | | |
| Illiterate | | 134 | 23.7 | 1595 | 43.0 |
| Read & write | | 29 | 5.1 | 366 | 9.9 |
| Secondary school level or lower | | 233 | 41.2 | 1101 | 29.7 |
| University level (Bachelor) | | 114 | 20.1 | 353 | 9.5 |
| Postgraduate level | | 1 | 0.2 | 8 | 0.2 |
| Missed | | 55 | 9.7 | 288 | 7.8 |
| Total | | 566 | 100 | 3711 | 100 |
| **Smoking status** | | | | | |
| Smoker | | 34 | 6.0 | 178 | 4.8 |
| X-smoker | | 4 | 0.7 | 44 | 1.2 |
| Non-smoker | | 496 | 87.6 | 3300 | 88.9 |
| Missed | | 32 | 5.7 | 189 | 5.1 |
| Total | | 566 | 100 | 3711 | 100 |
| **BMI class** | | | | | |
| Underweight | <18.49 kg/m² | 30 | 5.3 | 16 | 0.4 |
| Normal | 18.5-24.99 kg/m² | 128 | 22.6 | 371 | 10.0 |
| Overweight | 25-29.99 kg/m² | 149 | 26.3 | 1076 | 29.0 |
| Obese I | 30-34.99 kg/m² | 110 | 19.4 | 1010 | 27.2 |
| Obese II | 35-39.99 kg/m² | 36 | 6.4 | 495 | 13.3 |
| Obese III | ≥ 40 kg/m² | 28 | 4.9 | 251 | 6.8 |
| Missed | | 85 | 15.0 | 492 | 13.3 |
| Total | | 566 | 100 | 3711 | 100 |

The highest proportion of illiteracy was among the patients of Alaziziah PHCC where 58.6% were illiterate and 22.6% have not received any official education but can read and write. The lowest proportion of illiteracy was at Almansak PHCC (13.9%). The proportions of patients with T1DM ranged from 3.5% of all the registered patients at Alaziziah PHCC to 25% at Almowadafeen PHCC as shown in table 13. The variation in the numbers of patients with T1DM and T2DM among PHCCs was statistically significant ($\chi^2$=150, df=9, P <0.000). On the other hand, the variation in the numbers of patients in each BMI class among the PHCCs was not statistically significant ($\chi^2$=32.4, df=27, P=0.215).

## Table 13: Demographic characteristics of patients with diabetes in each PHCC

| | PHCCs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Almanhal | Wasat Abha | Almansak | Almowadafeen | Johaan | Sultan City | Alkaabel | Alaziziah | Therah | Alnumais |
| | % (/668) | % (/796) | % (/208) | % (/527) | % (/83) | % (/498) | % (/700) | % (/314) | % (/204) | % (/460) |
| **Registered prevalence*** | 3.90 | 4.20 | 2.23 | 2.90 | 7.20 | 5.08 | 5.30 | 4.53 | 2.83 | 2.65 |
| **Age Categories** | | | | | | | | | | |
| Children ≤ 14 Y | 0.4 | 0.6 | 0.5 | 0.4 | 1.2 | 1.2 | 0.4 | 0.3 | 0.5 | 1.5 |
| Youth (15-24 Y) | 1.9 | 2.3 | 3.8 | 1.7 | 4.8 | 3.2 | 4.1 | 1.6 | 1.0 | 2.0 |
| Adults (25-44 Y) | 13.6 | 10.3 | 16.8 | 10.1 | 10.8 | 10.0 | 8.6 | 7.0 | 17.2 | 10.9 |
| Middle Age (45-64 Y) | 48.4 | 45.4 | 56.7 | 57.3 | 42.2 | 58.2 | 51.3 | 49.0 | 48.5 | 52.8 |
| Older people (≥ 65 Y) | 35.5 | 40.2 | 22.1 | 30.6 | 41.0 | 27.3 | 35.6 | 41.1 | 32.8 | 32.8 |
| Missed | 0.1 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| **Gender** | | | | | | | | | | |
| Male | 50.4 | 54.3 | 63.0 | 57.9 | 51.8 | 52.0 | 45.9 | 42.4 | 47.1 | 50.2 |
| Female | 49.6 | 43.3 | 36.1 | 38.7 | 48.2 | 43.8 | 52.6 | 52.9 | 52.5 | 48.5 |
| Missed | 0.0 | 2.4 | 1.0 | 3.4 | 0.0 | 4.2 | 1.6 | 4.8 | 0.5 | 1.3 |
| **Occupation** | | | | | | | | | | |
| Retired | 20.2 | 28.3 | 18.8 | 28.1 | 21.7 | 31.9 | 28.4 | 19.7 | 21.1 | 20.2 |
| Unemployed | 56.0 | 37.3 | 38.5 | 40.6 | 47.0 | 47.6 | 55.3 | 54.1 | 50.0 | 50.0 |
| Employed | 23.7 | 28.9 | 24.5 | 25.8 | 20.5 | 14.9 | 14.6 | 23.6 | 23.5 | 20.2 |
| Irregular work | 0.1 | 1.9 | 3.4 | 1.3 | 4.8 | 0.4 | 0.4 | 1.6 | 2.0 | 6.5 |
| Missed | 0.0 | 3.6 | 14.9 | 4.2 | 6.0 | 5.2 | 1.3 | 1.0 | 3.4 | 3.0 |
| **Education Level** | | | | | | | | | | |
| Illiterate | 48.5 | 41.2 | 13.9 | 41.6 | 43.4 | 41.4 | 31.9 | 58.6 | 33.8 | 40.4 |
| Read & write | 4.0 | 13.9 | 17.3 | 3.6 | 4.8 | 1.6 | 14.7 | 22.6 | 5.4 | 4.3 |
| Secondary school level or lower | 34.7 | 29.5 | 19.2 | 31.7 | 31.3 | 44.4 | 33.3 | 11.5 | 20.1 | 33.5 |
| University level (Bachelor) | 12.7 | 11.6 | 21.6 | 14.2 | 13.3 | 6.2 | 7.4 | 5.7 | 11.8 | 11.5 |
| Postgraduate level | 0.0 | 0.6 | 0.5 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.2 |
| Missed | 0.0 | 3.1 | 27.4 | 8.9 | 7.2 | 6.0 | 12.7 | 1.6 | 28.9 | 10.0 |

*Continued*

| | PHCCs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Almanhal % (/668) | Wasat Abha % (/796) | Almansak % (/208) | Almowadafeen % (/527) | Johaan % (/83) | Sultan City % (/498) | Alkaabel % (/700) | Alaziziah % (/314) | Therah % (/204) | Alnumais % (/460) |
| **Smoking status** | | | | | | | | | | |
| Smoker | 2.2 | 4.4 | 8.7 | 6.5 | 6.0 | 5.2 | 4.7 | 4.8 | 5.4 | 5.9 |
| X-smoker | 1.0 | 1.3 | 0.0 | 0.9 | 0.0 | 1.8 | 2.0 | 1.0 | 1.5 | 0.4 |
| Non-smoker | 96.7 | 86.9 | 72.6 | 83.1 | 86.7 | 91.4 | 90.4 | 91.1 | 80.9 | 87.4 |
| Missed | 0.0 | 7.4 | 18.8 | 9.5 | 7.2 | 1.6 | 2.9 | 3.2 | 12.3 | 6.3 |
| **Marital status** | | | | | | | | | | |
| Single | 3.3 | 6.7 | 7.7 | 3.4 | 8.4 | 6.4 | 6.6 | 4.5 | 4.4 | 5.4 |
| Married | 88.2 | 84.8 | 88.5 | 85.0 | 69.9 | 84.7 | 89.0 | 85.0 | 84.8 | 87.2 |
| Divorced | 3.4 | 1.3 | 0.0 | 0.4 | 1.2 | 0.4 | 0.4 | 1.9 | 0.5 | 0.7 |
| Widowed | 5.1 | 5.8 | 1.0 | 2.7 | 19.3 | 5.8 | 3.4 | 7.0 | 7.8 | 5.2 |
| Other | 0.0 | 0.1 | 0.0 | 0.2 | 0.0 | 0.2 | 0.0 | 0.0 | 0.5 | 0.0 |
| Missed | 0.0 | 1.4 | 2.9 | 8.3 | 1.2 | 2.4 | 0.6 | 1.6 | 2.0 | 1.5 |
| **Type of diabetes** | | | | | | | | | | |
| Type 1 | 8.7 | 9.5 | 11.5 | 24.9 | 20.5 | 18.7 | 11.3 | 3.5 | 9.8 | 12.4 |
| Type 2 | 90.9 | 86.8 | 76.9 | 66.4 | 79.5 | 75.5 | 85.6 | 91.4 | 89.2 | 85.4 |
| Gestational diabetes | 0.1 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.7 | 0.3 | 0.0 | 0.0 |
| Other | 0.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.3 | 0.0 | 0.2 |
| Missed | 0.0 | 2.6 | 11.1 | 8.7 | 0.0 | 5.8 | 2.1 | 3.5 | 1.0 | 2.0 |
| **BMI class** | | | | | | | | | | |
| Underweight <18.49 kg/m$^2$ | 0.7 | 1.1 | 1.9 | 0.6 | 3.6 | 0.4 | 1.1 | 1.3 | 0.5 | 1.5 |
| Normal 18.5-24.99 kg/m$^2$ | 14.4 | 7.7 | 9.6 | 14.0 | 12.0 | 12.0 | 14.3 | 10.2 | 10.3 | 9.3 |
| Overweight 25-29.99 kg/m$^2$ | 34.6 | 17.3 | 32.7 | 30.4 | 30.1 | 28.5 | 29.7 | 22.6 | 34.3 | 33.7 |
| Obese I 30-34.99 kg/m$^2$ | 27.2 | 19.6 | 29.8 | 26.8 | 28.9 | 29.5 | 25.0 | 23.6 | 30.9 | 32.2 |
| Obese II 35-39.99 kg/m$^2$ | 15.3 | 8.4 | 8.2 | 13.3 | 10.8 | 13.5 | 13.6 | 8.3 | 16.2 | 14.6 |
| Obese III ≥40 kg/m$^2$ | 7.3 | 4.4 | 6.7 | 8.2 | 7.2 | 5.6 | 8.6 | 5.7 | 4.9 | 7.0 |
| Missed | 0.4 | 41.5 | 11.1 | 6.8 | 7.2 | 10.4 | 7.7 | 28.3 | 2.9 | 1.7 |

[*] *The registered prevalence was presented here as a percentage by dividing the total number of the registered patients with diabetes on the total population for each PHCC.*

***ADC:***

Of the reviewed sample of case notes at ADC, 65% were over 45 years old. In comparison to PHCCs, more children and youths are managed in ADC (3.2% versus 18.6%) and therefore more patients with T1DM (12.7% at PHCCs versus 22% at ADC). The unemployment rate was almost 40% (47.8% at PHCCs) and the proportion of non-smokers was almost similar to that of the PHCCs' (88% versus 82% respectively). More than 55% of the reviewed case notes were referred to ADC from Aseer central hospital, 16.5% from Abha general hospital and 9.6% from the PHCCs.

Table 14 shows the characteristics of the reviewed sample of patients with diabetes attending the ADC. The sample had demographic characteristics similar to the PHCCs group. For example, the majority of female patients were unemployed; most of the patients were non-smokers and overweight was more common among males than females (30.9% versus 16%), while obesity was more common among females than males (50.3% versus 33.2%). However, there were higher proportions of T1DM patients and underweight patients at ADC than at PHCCs.

Table 15 shows the characteristics of T1DM and T2DM patients at ADC. T1DM patients at ADC were younger (70% were less than 25 years old versus 23%) and thinner (20% were either overweight or obese versus 56.8%) than those at PHCCs.

**Table 14: Characteristics of the reviewed sample of patients with diabetes at ADC by gender**

| | Gender | | | | |
|---|---|---|---|---|---|
| | Male | | Female | | Missed |
| | Number | % (/265) | Number | % (/256) | Number |
| ***Age categories*** | | | | | |
| Children ≤ 14 Y | 32 | 12.1 | 24 | 9.4 | 6 |
| Youth (15-24 Y) | 21 | 7.9 | 17 | 6.6 | 2 |
| Adults (25-44 Y) | 32 | 12.1 | 50 | 19.5 | 5 |
| Middle Age (45-64 Y) | 115 | 43.4 | 114 | 44.5 | 10 |
| Older people (≥ 65 Y) | 65 | 24.5 | 50 | 19.5 | 7 |
| Missed | 0 | 0.0 | 1 | 0.4 | 0 |
| ***Occupation*** | | | | | |
| Retired | 87 | 32.8 | 1 | 0.4 | 4 |
| Unemployed | 18 | 6.8 | 191 | 74.6 | 10 |
| Employed | 69 | 26.0 | 10 | 3.9 | 10 |
| Irregular work | 0 | 0.0 | 0 | 0.0 | 0 |
| Student | 44 | 16.6 | 41 | 16.0 | 3 |
| Missed | 47 | 17.7 | 13 | 5.1 | 3 |
| ***Place of referral*** | | | | | |
| ACH | 141 | 53.2 | 148 | 57.8 | 17 |
| AGH | 46 | 17.4 | 42 | 16.4 | 3 |
| PHCC | 27 | 10.2 | 23 | 9.0 | 3 |
| Other | 1 | 0.4 | 2 | 0.8 | 0 |
| Missed | 50 | 18.9 | 41 | 16.0 | 7 |
| ***Smoking status*** | | | | | |
| Smoker | 22 | 8.3 | 1 | 0.4 | 2 |
| X-Smoker | 13 | 4.9 | 2 | 0.8 | 0 |
| Non-Smoker | 194 | 73.2 | 235 | 91.8 | 25 |
| Missed | 36 | 13.6 | 18 | 7.0 | 3 |
| ***Type of diabetes*** | | | | | |
| Type 1 | 55 | 20.8 | 58 | 22.7 | 8 |
| Type 2 | 199 | 75.1 | 187 | 73.0 | 22 |
| Gestational Diabetes | 0 | 0.0 | 0 | 0.0 | 0 |
| Other types | 0 | 0.0 | 0 | 0.0 | 0 |
| Missed | 11 | 4.2 | 11 | 4.3 | 0 |
| ***BMI class*** | | | | | |
| Underweight <18.49 kg/m² | 24 | 9.1 | 21 | 8.2 | 4 |
| Normal 18.5-24.99 kg/m² | 49 | 18.5 | 41 | 16.0 | 5 |
| Overweight 25-29.99 kg/m² | 82 | 30.9 | 41 | 16.0 | 6 |
| Obese I 30-34.99 kg/m² | 52 | 19.6 | 63 | 24.6 | 8 |
| Obese II 35-39.99 kg/m² | 27 | 10.2 | 38 | 14.8 | 5 |
| Obese III ≥ 40 kg/m² | 9 | 3.4 | 28 | 10.9 | 1 |
| Missed | 22 | 8.3 | 24 | 9.4 | 1 |
| Total | 265 | 100 | 256 | 100 | 30 |

### Table 15: Characteristics of T1DM and T2DM patients at ADC

| | Type of diabetes | | | |
|---|---|---|---|---|
| | T1DM | | T2DM | |
| | Number | % (/121) | Number | % (/408) |
| ***Age Categories*** | | | | |
| Children ≤ 14 Y | 54 | 44.6 | 5 | 1.2 |
| Youth (15-24 Y) | 31 | 25.6 | 9 | 2.2 |
| Adults (25-44 Y) | 22 | 18.2 | 61 | 15.0 |
| Middle Age (45-64 Y) | 8 | 6.6 | 221 | 54.2 |
| Older people (≥ 65 Y) | 5 | 4.1 | 112 | 27.5 |
| Missed | 1 | 0.8 | 0 | 0.0 |
| Total | 121 | 100 | 408 | 100 |
| ***Gender*** | | | | |
| Male | 55 | 45.5 | 199 | 48.8 |
| Female | 58 | 47.9 | 187 | 45.8 |
| Missed | 8 | 6.6 | 22 | 5.4 |
| Total | 121 | 100 | 408 | 100 |
| ***Occupation*** | | | | |
| Retired | 2 | 1.7 | 86 | 21.1 |
| Unemployed | 34 | 28.1 | 175 | 42.9 |
| Employed | 9 | 7.4 | 78 | 19.1 |
| Irregular work | 0 | 0.0 | 0 | 0.0 |
| Student | 73 | 60.3 | 13 | 3.2 |
| Missed | 3 | 2.5 | 56 | 13.7 |
| Total | 121 | 100 | 408 | 100.0 |
| ***Place of referral*** | | | | |
| ACH | 66 | 54.5 | 229 | 56.1 |
| AGH | 14 | 11.6 | 72 | 17.6 |
| PHCC | 11 | 9.1 | 40 | 9.8 |
| Other | 1 | 0.8 | 2 | 0.5 |
| Missed | 29 | 24.0 | 65 | 15.9 |
| Total | 121 | 100 | 408 | 100 |
| ***Smoking status*** | | | | |
| Smoker | 3 | 2.5 | 21 | 5.1 |
| X-smoker | 1 | 0.8 | 14 | 3.4 |
| Non-smoker | 101 | 83.5 | 340 | 83.3 |
| Missed | 16 | 13.2 | 33 | 8.1 |
| Total | 121 | 100 | 408 | 100 |
| ***BMI class*** | | | | |
| Underweight <18.49 kg/m$^2$ | 44 | 36.4 | 2 | 0.5 |
| Normal 18.5-24.99 kg/m$^2$ | 45 | 37.2 | 46 | 11.3 |
| Overweight 25-29.99 kg/m$^2$ | 15 | 12.4 | 112 | 27.5 |
| Obese I 30-34.99 kg/m$^2$ | 7 | 5.8 | 111 | 27.2 |
| Obese II 35-39.99 kg/m$^2$ | 0 | 0.0 | 67 | 16.4 |
| Obese III ≥ 40 kg/m$^2$ | 2 | 1.7 | 36 | 8.8 |
| Missed | 8 | 6.6 | 34 | 8.3 |
| Total | 121 | 100 | 408 | 100 |

### 6.4.2. Processes of diabetes care

According to national manuals and guidelines,[200-202, 214-216] there are 16 healthcare checks (or care processes) that everyone with diabetes should receive either at each visit to the PHCC or each year by referral to the nearest hospital. At each visit to the PHCC, the patient with diabetes should receive the following healthcare checks: BMI measurement, FBG or RBG and blood pressure (BP), assessment of patient compliance and foot examination. These healthcare checks in addition to HbA1c, cholesterol, triglycerides, blood creatinine, urinary albumin, ECG, cardiovascular system examination, eye (fundus) examination, chest X-ray and smoking review should be part of the annual review. These checks are done by referring to hospital. [214]

***Antidiabetic drug prescribing (PHCCs):***

Among adults (≥ 20years) with diabetes in Abha city, 63.7% take oral antidiabetic medications, 20.3% take insulin only, 9.9% take both insulin and oral medication and only 3.3% were on no medication (diet and exercise). For all patients with diabetes, the most commonly prescribed antidiabetic medications, either alone or in combinations, were metformin (59.7%) and glibenclamide (42.6%). Only 2.7% of patients were on diet and exercise monotherapy and more than 31% (1391 patients) were on either insulin monotherapy or one of its combinations. As shown in table 16, the most common prescribed classes of drugs were metformin in combination with glibenclamide (31.5%), followed by Insulin monotherapy (21.4%), metformin monotherapy (12.1%), glibenclamide monotherapy (9.8%), insulin in combination with metformin (8.3%) and metformin in combination with gliclazide (6.8%).

**Table 16: Gender distribution of drugs prescribed to patients with diabetes in PHCCs**

| Treatment class | Gender | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Missed | | Total | |
| | No. | % (/2288) | No. | % (/2077) | No. | % (/93) | No. | % (/4458) |
| **Monotherapy** | | | | | | | | |
| Diet & Exercise | 53 | 2.3 | 64 | 3.1 | 3 | 3.2 | 120 | 2.7 |
| Metformin | 246 | 10.8 | 275 | 13.2 | 17 | 18.3 | 538 | 12.1 |
| Glibenclamide | 265 | 11.6 | 163 | 7.8 | 7 | 7.5 | 435 | 9.8 |
| Gliclazide | 67 | 2.9 | 48 | 2.3 | 2 | 2.2 | 117 | 2.6 |
| Insulin | 521 | 22.8 | 411 | 19.8 | 23 | 24.7 | 955 | 21.4 |
| **Combination therapy** | | | | | | | | |
| Metformin+Glibenclamide | 711 | 31.1 | 671 | 32.3 | 21 | 22.6 | 1403 | 31.5 |
| Metformin+Gliclazide | 149 | 6.5 | 145 | 7.0 | 7 | 7.5 | 301 | 6.8 |
| Glibenclamide+Gliclazide | 2 | 0.1 | 3 | 0.1 | 0 | 0.0 | 5 | 0.1 |
| Insulin+Metformin | 158 | 6.9 | 201 | 9.7 | 9 | 9.7 | 368 | 8.3 |
| Insulin+Glibenclamide | 7 | 0.3 | 8 | 0.4 | 0 | 0.0 | 15 | 0.3 |
| Insulin+Gliclazide | 1 | 0.0 | 2 | 0.1 | 0 | 0.0 | 3 | 0.1 |
| Insulin+Metformin+Glibenclamide | 18 | 0.8 | 21 | 1.0 | 0 | 0.0 | 39 | 0.9 |
| Insulin+Metformin+Gliclazide | 7 | 0.3 | 4 | 0.2 | 0 | 0.0 | 11 | 0.2 |
| Other combinations or missed | 83 | 3.6 | 61 | 2.9 | 4 | 4.3 | 148 | 3.3 |
| **Total** | **2288** | ***100*** | **2077** | ***100*** | **93** | ***100*** | **4458** | ***100*** |

Metformin or any of its combinations was prescribed more to females (63.5%) when compared to males (56.4%). Both glibenclamide monotherapy and insulin monotherapy or any of their combinations were prescribed to both males and females almost equally (44% versus 42% for glibenclamide and 31% versus 31% for insulin respectively). Table 17 illustrates that among children, youth and adult patients, insulin monotherapy was the most frequently prescribed antidiabetic drug, while metformin combined with glibenclamide was commonest among the middle and older age groups.

## Table 17: Age category distribution of prescribed antidiabetic drugs among patients with diabetes in PHCCs

| Treatment class | Age Categories | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Children & Youth (0-24Y) | | Adults (25-44 Y) | | Middle age (45-64 Y) | | Older people (≥ 65 Y) | | Missed | | Total | |
| | No. | % (/143) | No. | % (/487) | No. | % (/2284) | No. | % (/1530) | No. | % (/14) | No. | % (/4458) |
| **Monotherapy** | | | | | | | | | | | | |
| Diet & Exercise | 0 | *0.0* | 18 | *3.7* | 77 | *3.4* | 25 | *1.6* | 0 | *0.0* | 120 | *2.7* |
| Metformin | 1 | *0.7* | 84 | *17.2* | 307 | *13.4* | 145 | *9.5* | 1 | *7.1* | 538 | *12.1* |
| Glibenclamide | 0 | *0.0* | 41 | *8.4* | 203 | *8.9* | 189 | *12.4* | 2 | *14.3* | 435 | *9.8* |
| Gliclazide | 0 | *0.0* | 9 | *1.8* | 44 | *1.9* | 63 | *4.1* | 1 | *7.1* | 117 | *2.6* |
| Insulin | 134 | *93.7* | 151 | *31.0* | 348 | *15.2* | 322 | *21.0* | 0 | *0.0* | 955 | *21.4* |
| **Combination therapy** | | | | | | | | | | | | |
| Metformin+Glibenclamide | 2 | *1.4* | 103 | *21.1* | 793 | *34.7* | 499 | *32.6* | 6 | *42.9* | 1403 | *31.5* |
| Metformin+Gliclazide | 1 | *0.7* | 22 | *4.5* | 182 | *8.0* | 95 | *6.2%* | 1 | *7.1* | 301 | *6.8* |
| Glibenclamide+Gliclazide | 0 | *0.0* | 0 | *0.0* | 2 | *0.1* | 3 | *0.2* | 0 | *0.0* | 5 | *0.1* |
| Insulin+Metformin | 2 | *1.4* | 34 | *7.0* | 213 | *9.3* | 119 | *7.8* | 0 | *0.0* | 368 | *8.3* |
| Insulin+Glibenclamide | 0 | *0.0* | 1 | *.2* | 7 | *0.3* | 7 | *0.5* | 0 | *0.0* | 15 | *0.3* |
| Insulin+Gliclazide | 0 | *0.0* | 1 | *0.2* | 2 | *0.1* | 0 | *0.0* | 0 | *0.0* | 3 | *0.1* |
| Insulin+Metformin+Glibenclamide | 1 | *0.7* | 3 | *0.6* | 24 | *1.1* | 11 | *0.7* | 0 | *0.0* | 39 | *0.9* |
| Insulin+Metformin+Gliclazide | 0 | *0.0* | 0 | *0.0* | 7 | *0.3* | 4 | *0.3* | 0 | *0.0* | 11 | *0.2* |
| Other combinations or missed | 2 | *1.4* | 20 | *4.1* | 75 | *3.3* | 48 | *3.1* | 3 | *21.4* | 148 | *3.3* |
| **Total** | **143** | ***100*** | **487** | ***100*** | **2284** | ***100*** | **1530** | ***100*** | **14** | ***100*** | **4458** | ***100*** |

**Table 18: Antidiabetic drug prescribing variability among PHCCs for patients with T1DM**

| PHCC Name | Treatment class (%) | | | | |
|---|---|---|---|---|---|
| | Insulin monotherapy | Insulin combinations | Missed | Total | |
| | | | | No. | % |
| **Almanhal** | 69.0 | 29.3 | 1.7 | 58 | 100 |
| **Wasat Abha** | 90.8 | 3.9 | 5.3 | 76 | 100 |
| **Almansak** | 75.0 | 25 | 0.0 | 24 | 100 |
| **Almowadafeen** | 51.9 | 48.1 | 0.0 | 131 | 100 |
| **Johaan** | 100.0 | 0 | 0.0 | 17 | 100 |
| **Sultan City** | 82.8 | 16.1 | 1.1 | 93 | 100 |
| **Alkaabel** | 93.7 | 5.0 | 1.3 | 79 | 100 |
| **Alaziziah** | 90.9 | 9.1 | 0.0 | 11 | 100 |
| **Therah** | 90.0 | 10 | 0.0 | 20 | 100 |
| **Alnumais** | 91.2 | 8.8 | 0.0 | 57 | 100 |
| **Total** | **78.3** | **20.5** | **1.2** | **566** | **100** |

Table 18 shows that there is significant variation among different PHCCs in the type of antidiabetic therapy prescribed for patients with T1DM. For example, insulin monotherapy was exclusively (100%) the pattern of therapy prescribed for patients with T1DM at Johaan PHCC, while only about half of the T1DM patients at Almowadafeen PHCC received this type of therapy. The other half of the T1DM patients at Almowadafeen PHCC received insulin therapy in combination with one or two oral antidiabetic drugs. For all T1DM patients in Abha city, insulin monotherapy was the commonest class of treatment prescribed, accounting for 78.3%, followed by insulin + metformin combination (17.8%).

As shown in table 19, among different PHCCs, there was a considerable variation in prescribing insulin monotherapy or insulin in combination with other oral antidiabetic drugs for patients with T2DM. Few patients with T2DM were treated by insulin or insulin combinations at both Sultan city (7.5%) and Almowadafeen PHCCs (1.4%) when

compared to other PHCCs. For all T2DM patients in Abha city, metformin + glibenclamide combination was the commonest class of treatment prescribed, accounting for 36.2%, followed by metformin monotherapy (13.9%), insulin monotherapy (13.3%), glibenclamide monotherapy (11.3%), metformin + gliclazide (7.7%) and insulin + metformin (6.8%).

**Table 19: Antidiabetic drug prescribing variability among PHCCs for patients with T2DM**

| PHCCs | Treatment class (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Diet & Exercise only | One oral drug | Two oral drugs | Insulin monotherapy | Insulin combinations | Others + Missed | Total | |
| | | | | | | | No. | % |
| **Almanhal** | 1.3 | 23.7 | 43.8 | 8.1 | 22.4 | 0.7 | 607 | *100* |
| **Wasat Abha** | 1.9 | 30.5 | 39.9 | 17.5 | 4.1 | 6.1 | 691 | *100* |
| **Almansak** | 2.5 | 31.9 | 37.5 | 9.4 | 16.2 | 2.5 | 160 | *100* |
| **Almowadafeen** | 1.7 | 38.3 | 56.0 | 0.9 | 0.5 | 2.6 | 350 | *100* |
| **Johaan** | 1.5 | 33.3 | 43.9 | 12.1 | 9.2 | 0.0 | 66 | *100* |
| **Sultan City** | 8.5 | 26.1 | 50.8 | 5.1 | 2.4 | 7.2 | 376 | *100* |
| **Alkaabel** | 3.3 | 25.7 | 48.1 | 14.7 | 6.9 | 1.3 | 599 | *100* |
| **Alaziziah** | 2.4 | 30.3 | 34.8 | 19.5 | 8.5 | 4.5 | 287 | *100* |
| **Therah** | 3.8 | 20.9 | 36.8 | 19.2 | 12.2 | 7.1 | 182 | *100* |
| **Alnumais** | 1.5 | 28.0 | 41.0 | 25.7 | 3 | 0.8 | 393 | *100* |
| **Total** | **2.8** | **28.3** | **44.0** | **13.3** | **8.3** | **3.3** | **3711** | ***100*** |

For 60% of the registered patients with diabetes at all the PHCCs, the mean FBG of the most recent readings during the preceding 12 months was calculated. Table 20 summarizes the distribution of the FBG for each type of antidiabetic therapy. As shown, over half of patients, who were on insulin monotherapy or insulin combined with other oral drugs, had poor glycemic control (FBG > 180 mg/dl (10 mmol/l)). Those patients who were on oral monotherapy were more likely to attain an acceptable level of FBG than those on oral combination therapy.

Based on the local management protocol, the initial prescribed therapy for T1DM is insulin monotherapy. For T2DM, if the diet and exercise failed to control diabetes

within the first 1-3 months, the initial prescribed drugs are either metformin if the patient's BMI ≥ 30 kg/$m^2$ or glibenclamide if the BMI < 30 kg/$m^2$. If monotherapy failed to control the level of blood glucose then combination therapy is used by adding more oral antidiabetic drugs. For T2DM, if the oral combination therapy failed to control diabetes then the patient should be shifted to insulin monotherapy or insulin combination therapy. It is expected that those patients who are on insulin monotherapy or insulin combination therapy should have the best control of blood glucose. However, table 20 shows that as intensity of treatment increases, the proportion of patients with poor control rises from 14% to over 50%. This means that prescribing more oral antidiabetic drugs or adding insulin is not sufficient to control blood glucose.

**Table 20: Distribution of antidiabetic drugs by categories of FBG**

| Treatment Types | FBG categories | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Excellent** < 126 mg/dl (7mmol/l) | | **Acceptable** 126 - 180 mg/dl (7-10 mmol/l) | | **Poor** > 180 mg/dl (10 mmol/l) | | Total | |
| | No. | % | No. | % | No. | % | No. | % |
| Diet & Exercise | 22 | *44.9* | 20 | *40.8* | 7 | *14.3* | 49 | *100* |
| Metformin | 122 | *32.1* | 188 | *49.5* | 70 | *18.4* | 380 | *100* |
| Glibenclamide | 42 | *24.3* | 86 | *49.7* | 45 | *26.0* | 173 | *100* |
| Gliclazide | 16 | *29.1* | 24 | *43.6* | 15 | *27.3* | 55 | *100* |
| Metformin combinations (oral)* | 195 | *16.6* | 487 | *41.5* | 492 | *41.9* | 1174 | *100* |
| Insulin | 86 | *17.6* | 143 | *29.2* | 260 | *53.2* | 489 | *100* |
| Insulin combinations** | 43 | *13.9* | 106 | *34.3* | 160 | *51.8* | 309 | *100* |
| Missed | 8 | *19.5* | 12 | *29.3* | 21 | *51.2* | 41 | *100* |
| **Total** | **534** | ***20.0*** | **1066** | ***39.9*** | **1070** | ***40.1*** | **2670** | ***100*** |

** Metformin combinations are Metformin+Glibenclamide or Metformin+Gliclazide*

*** Insulin combinations are Insulin+Metformin or Insulin+Metformin+Glibenclamide*

For both overweight and obese patients, the commonest prescribed therapy was the combination of metformin plus glibenclamide (36% and 32% respectively), followed by insulin monotherapy and metformin monotherapy. For patients with underweight or normal weight, the commonest prescribed therapy was insulin monotherapy (65% and 31% respectively), followed by the combination of metformin plus glibenclamide and the monotherapy of glibenclamide. Other types of drugs, such as glimepiride, glipizide and glitazones, were not usually prescribed to patients because they are not available at the PHCCs.

*Other co-prescribed medications:*

Aspirin, antihypertensive and lipid-lowering medicines were commonly prescribed medications along with the antidiabetic drugs. However, huge variability and inequity in prescribing of these medications was observed among the PHCCs in Abha city. At Wasat Abha PHCC, aspirin was prescribed for 9.3% of the registered patients with diabetes; while at Almanhal PHCC, it was prescribed for more than 72% of the registered patients. Other medications such as Angiotensin II Receptor Blockers (ARBs), Angiotensin Converting Enzyme Inhibitors (ACEIs) and statins were variably prescribed to patients as shown in table 21.

**Table 21: Variability of prescribing other drugs for patients with diabetes by PHCCs**

| PHCCs | Treatment class (%) | | | | |
|---|---|---|---|---|---|
| | ACEIs* | ARBs** | Aspirin | Statins | Total No. |
| **Almanhal** | 42.7 | 2.1 | 72.2 | 28.4 | **668** |
| **Wasat Abha** | 6.9 | 0.6 | 9.3 | 1.1 | **796** |
| **Almansak** | 2.9 | 1.4 | 49.0 | 2.4 | **208** |
| **Almowadafeen** | 0.2 | 0.0 | 58.4 | 17.5 | **527** |
| **Johaan** | 0.0 | 0.0 | 10.8 | 0.0 | **83** |
| **Sultan City** | 11.0 | 0.6 | 26.5 | 0.6 | **498** |
| **Alkaabel** | 5.7 | 6.4 | 23.4 | 0.3 | **700** |
| **Alaziziah** | 5.1 | 0.0 | 11.8 | 0.0 | **314** |
| **Therah** | 16.2 | 0.0 | 37.7 | 0.0 | **204** |
| **Alnumais** | 2.6 | 0.0 | 12.0 | 0.0 | **460** |
| **Total** | **11.3** | **1.6** | **32.3** | **6.8** | **4458** |

* *ACEIs: Angiotensin Converting Enzyme Inhibitors*
** *ARBs: Angiotensin II Receptor Blockers*

### *Antidiabetic drug prescribing (ADC):*

At ADC, the most commonly prescribed antidiabetic medications, either alone or in combinations, were metformin (66.4%) and insulin (62.6%), (Table 22). The proportion of insulin prescriptions at ADC was twice of that at the PHCCs (62.6% versus 31.2% respectively). The combination therapy of insulin + metformin was the commonest prescribed type of treatment (28.9%) at ADC, whereas in PHCCs, it was one of the least prescribed therapies (8.3%). The second commonest therapy method was the insulin monotherapy (27.8%), followed by metformin + glibenclamide (15%) and metformin monotherapy (13%).

At ADC, there was no significant variation in the type of therapy prescribed for males or females patients ($\chi^2$=3.6, df=11, p=0.9). Among children and youths, insulin monotherapy was the most frequently prescribed antidiabetic drug (88.2%), while among adult patients, insulin monotherapy and insulin + metformin were almost

equally prescribed (28.7%, 29.9% respectively). Among the middle and older age groups, the combination of insulin + metformin was the commonest prescribed therapy (35% and 34% respectively), followed by the combination therapy of metformin + glibenclamide (18% and 20% respectively), and the monotherapy of metformin (16.7% and 15.6% respectively).

It is apparent from table 22 that the vast majority of T1DM patients at ADC were on insulin monotherapy (91.7%). Few patients were on insulin + metformin combined therapy. Insulin monotherapy was given to a higher proportion of T1DM patients in ADC than in the PHCCs (91.7% versus 78.3% respectively).

**Table 22: Distribution of antidiabetic drugs by types of diabetes in ADC**

| Treatment Types | Type of diabetes | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | T1DM | | T2DM | | Missed data | | Total | |
| | No. | % (/121) | No. | % (/408) | No. | % (/22) | No. | % (/551) |
| **Monotherapy** | | | | | | | | |
| Diet & Exercise | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Metformin | 0 | 0.0 | 67 | 16.4 | 5 | 22.7 | 72 | 13.1 |
| Glibenclamide | 0 | 0.0 | 12 | 2.9 | 0 | 0.0 | 12 | 2.2 |
| Gliclazide | 0 | 0.0 | 3 | 0.7 | 0 | 0.0 | 3 | 0.5 |
| Insulin | 111 | 91.7 | 36 | 8.8 | 6 | 27.3 | 153 | 27.8 |
| **Combination therapy** | | | | | | | | |
| Metformin+Glibenclamide | 0 | 0.0 | 80 | 19.6 | 3 | 13.6 | 83 | 15.1 |
| Metformin+Gliclazide | 0 | 0.0 | 24 | 5.9 | 2 | 9.1 | 26 | 4.7 |
| Insulin+Metformin | 9 | 7.4 | 146 | 35.8 | 4 | 18.2 | 159 | 28.9 |
| Insulin+Glibenclamide | 0 | 0.0 | 4 | 1.0 | 0 | 0.0 | 4 | 0.7 |
| Insulin+Gliclazide | 0 | 0.0 | 3 | 0.7 | 0 | 0.0 | 3 | 0.5 |
| Insulin+Metformin+Glibenclamide | 1 | 0.8 | 18 | 4.4 | 1 | 4.5 | 20 | 3.6 |
| Insulin+Metformin+Gliclazide | 0 | 0.0 | 6 | 1.5 | 0 | 0.0 | 6 | 1.1 |
| Missed | 0 | 0.0 | 9 | 2.2 | 1 | 4.5 | 10 | 1.8 |
| **Total** | 121 | 100 | 408 | 100 | 22 | 100 | 551 | 100 |

For T2DM patients, more than one third of ADC patients (35.8%) were treated by the combination of insulin and metformin therapy, while in the PHCCs, only 6.8% of T2DM patients were using this type of combination therapy. At ADC, another one third (36%)

was treated by either metformin monotherapy or metformin in combination with glibenclamide.

For almost half (49%) of the reviewed sample of the registered patients with diabetes at ADC, the FBG for the preceding 12 months was obtained. Table 23 shows that the patients in the ADC are more likely to have better glycemic control when compared to those at the PHCCs (Table 20). However, the overall glycemic control was suboptimal. Other medications such as insulin mixtures (Mixtard), fast acting (Lispro, Aspart) and glimepiride were available but in small amounts.

**Table 23: Distribution of antidiabetic drugs by FBG categories at ADC**

| Treatment Types | FBG categories | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Excellent** < 126 mg/dl (7mmol/l) | | **Acceptable** 126 - 180 mg/dl (7-10 mmol/l) | | **Poor** > 180 mg/dl (10 mmol/l) | | **Total** | |
| | No. | % | No. | % | No. | % | No. | % |
| **Monotherapy** | | | | | | | | |
| Diet & Exercise | 0 | *0.0* | 0 | *0.0* | 0 | *0.0* | 0 | *0.0* |
| Metformin | 21 | *47.7* | 14 | *31.8* | 9 | *20.5* | 44 | *100* |
| Glibenclamide | 1 | *14.3* | 1 | *14.3* | 5 | *71.4* | 7 | *100* |
| Gliclazide | 1 | *50.0* | 1 | *50.0* | 0 | *0.0* | 2 | *100* |
| Insulin | 9 | *17.6* | 19 | *37.3* | 23 | *45.1* | 51 | *100* |
| **Combination therapy** | | | | | | | | |
| Metformin+Glibenclamide | 13 | *30.2* | 14 | *32.6* | 16 | *37.2* | 43 | *100* |
| Metformin+Gliclazide | 5 | *41.7* | 2 | *16.7* | 5 | *41.7* | 12 | *100* |
| Insulin+Metformin | 19 | *21.8* | 28 | *32.2* | 40 | *46.0* | 87 | *100* |
| Insulin+Glibenclamide | 1 | *50.0* | 1 | *50.0* | 0 | *0.0* | 2 | *100* |
| Insulin+Gliclazide | 1 | *33.3* | 2 | *66.7* | 0 | *0.0* | 3 | *100* |
| Insulin+Metformin+Glibenclamide | 3 | *33.3* | 4 | *44.4* | 2 | *22.2* | 9 | *100* |
| Insulin+Metformin+Gliclazide | 0 | *0.0* | 1 | *50.0* | 1 | *50.0* | 2 | *100* |
| Missed | 4 | *57.1* | 1 | *14.3* | 2 | *28.6* | 7 | *100* |
| **Total** | **78** | ***29.0*** | **88** | ***32.7*** | **103** | ***38.3*** | **269** | ***100*** |

*Other co-prescribed medications:*

At ADC, the patients were given more co-medications than those at the level of primary healthcare centres. This is might be because ADC provides diabetes care to more patients who suffer from diabetes complications. At ADC, aspirin and statins were prescribed to a greater proportion of T2DM patients than those at the PHCCs (Table 24).

**Table 24: The distribution of some medications by place of care and type of diabetes**

| Drugs | PHCCs | | | ADC | | |
|---|---|---|---|---|---|---|
| | T1DM % (/566) | T2DM % (/3711) | Total (including missed) % (/4458) | T1DM % (/121) | T2DM % (/408) | Total (including missed) % (/551) |
| **ACEIs*** | 6.0 | 12.4 | 11.2 | 4.1 | 18.4 | 15.2 |
| **ARBs**** | 0.4 | 1.8 | 1.6 | 0.0 | 1.7 | 1.3 |
| **Aspirin** | 20.8 | 34.1 | 32.3 | 6.6 | 71.3 | 56.4 |
| **Statins** | 5.1 | 7.1 | 6.8 | 4.1 | 19.6 | 16.5 |
| **Others** | 4.4 | 14.4 | 12.9 | 7.4 | 35.5 | 28.7 |

* *ACEIs: Angiotensin Converting Enzyme Inhibitors*
** *ARBs: Angiotensin II Receptor Blockers*

### *Annual referral and review in PHCCs:*

According to the local protocols, each patient with diabetes should be referred from the PHCC to the hospital to undergo some clinical examinations and lab investigations. In 2011, only 43.7% (1946/4458) of all patients with diabetes were referred from the PHCCs to Abha General Hospital (AGH) for annual checkups and hospital feedback rate was 71.3% (1387/1946). When looking at the most recent referral whatever the date/year was, 13.2% of patients have not been referred to AGH.

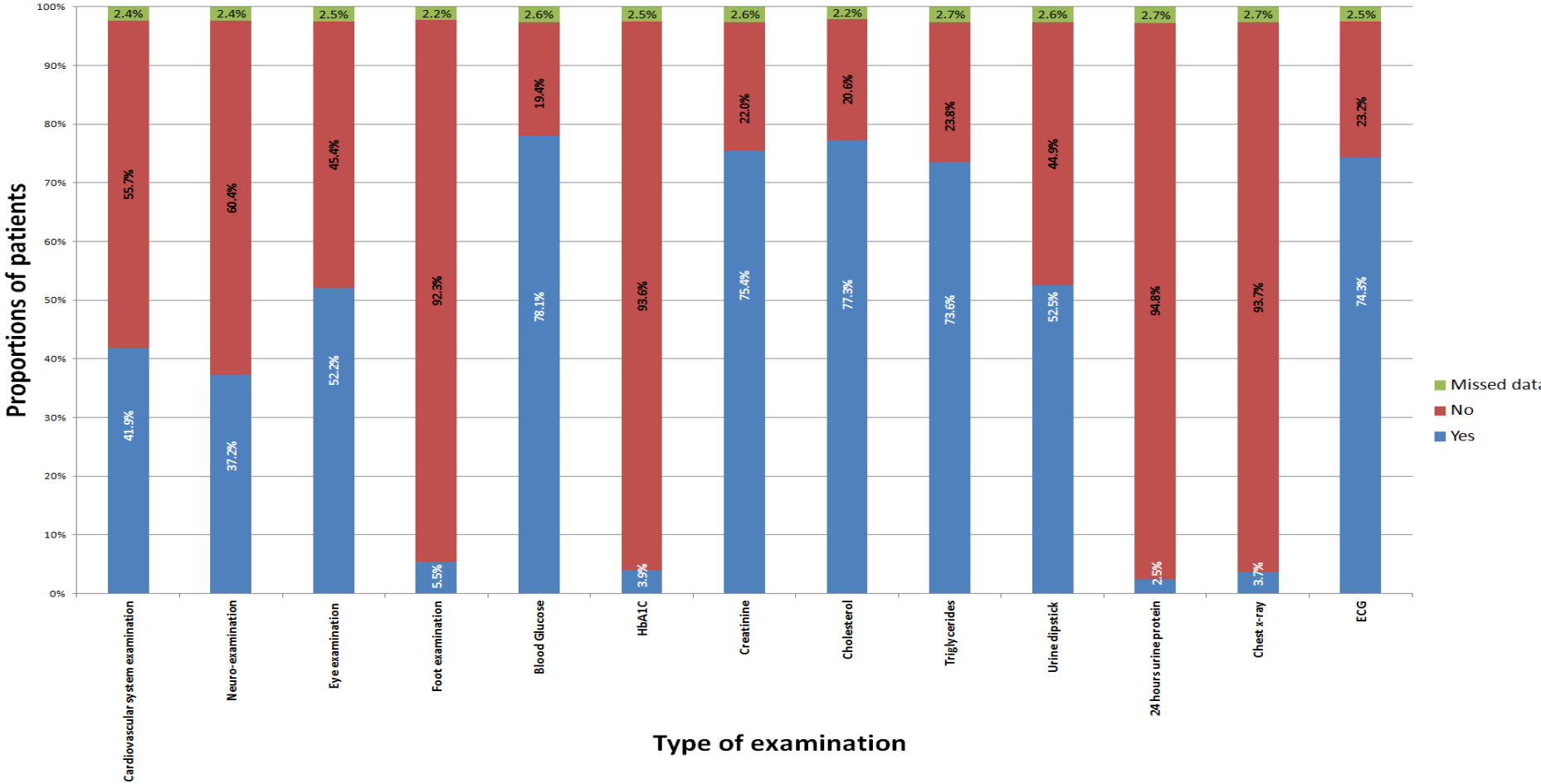
The proportions of patients who were referred for annual review in the preceding 12 months were low in Sultan city PHCC (18.8%), Wasat Abha PHCC (21.8%) and Alaziziah PHCC (26.5%). These centres in particular need to increase their annual referral rates.

The most recent annual referral and hospital feedback for each patient with diabetes were reviewed (Figure 26). Some lab investigations such as blood glucose, creatinine, cholesterol, triglycerides, and ECG were assessed for more than 73% of patients. On the other hand, HbA1c, chest x-ray and 24 hours urine protein have been assessed for very few patients. Clinical examinations conducted were much less frequently than lab investigations. Eye and foot examination was conducted for 52% and 5.4% of the patients respectively. Cardiovascular and nervous system examinations were conducted for 41.8% and 37.2% of patients respectively.

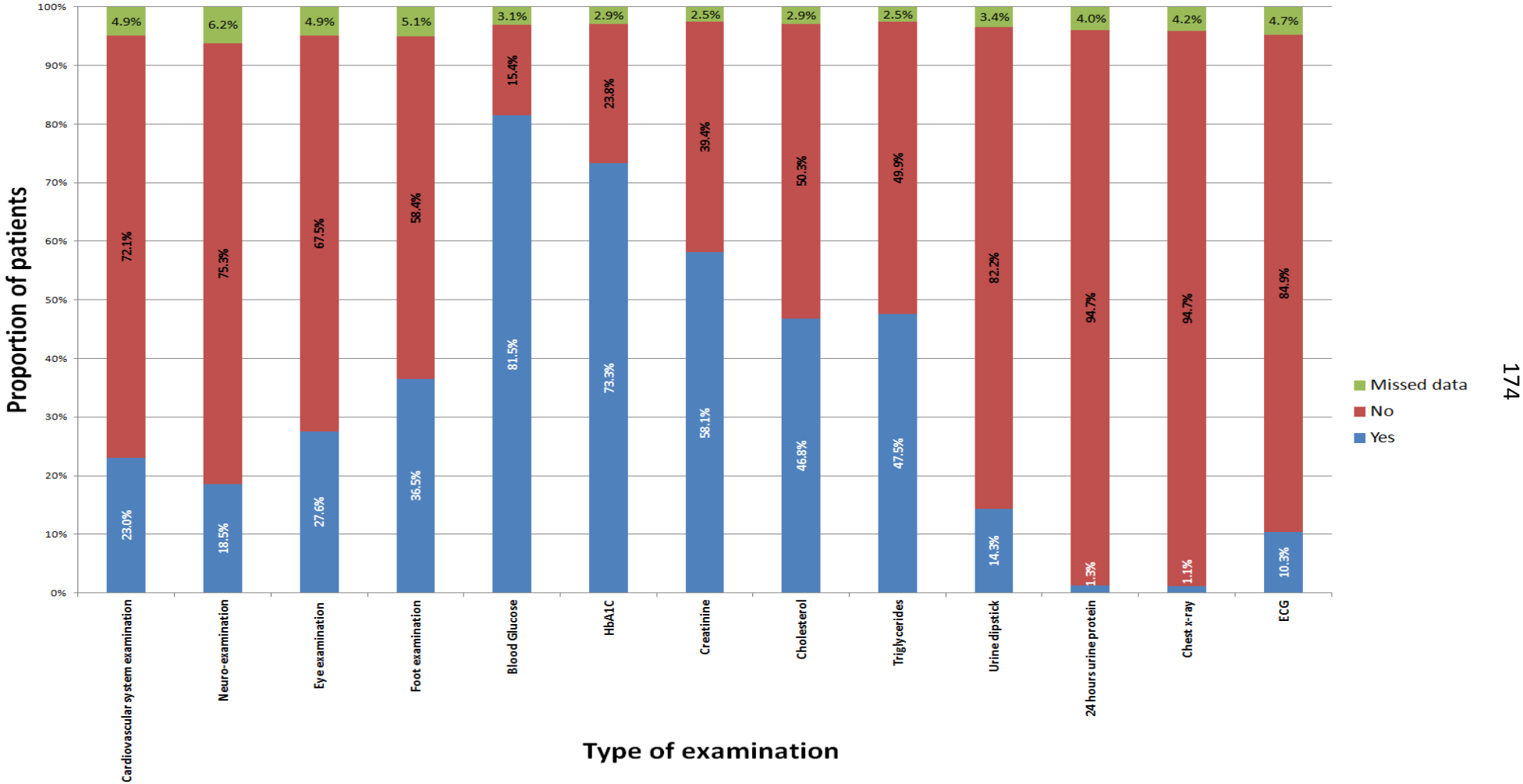
***Patient review in ADC:***

By reviewing the progress notes of the most recent visits within the preceding 12 months for a sample of patients at ADC, the data on the recorded clinical examinations and investigations were collected. The chart in figure 27, when compared with the data in figure 26, shows that only foot examination, blood glucose and HbA1c investigations were conducted at higher proportions in ADC than in the PHCCs.

**Figure 26: The proportions of conducted annual examinations and investigations for patients with diabetes at PHCCs (/4458)**



## Figure 27: The proportions of conducted examinations and investigations for patients with diabetes at ADC (/551)



***Follow-up visits to PHCCs:***

According to local protocols, each patient with diabetes should visit the diabetes clinic in the PHCC at least one time every three months.[201] However, as shown in figure 28, only 37.7% are actually doing that. According to the national standards,[200] those patients who have not visited the PHCC for six months or more should not exceed 20% of patients. However, this study found that almost 44% of patients have not visited their diabetes clinics during the previous 6 months. The proportion of those patients who attended the diabetes clinic for two times or more during the previous 6 months ranged from 17.5% at Wasat Abha PHCC to 68.8% at Almansak PHCC.

For the preceding 12 months, the most recent 3 readings of FBG and blood pressure (BP) were collected by reviewing the lab results or the diabetes follow-up chart of each patient's record.

The proportions of identified patients in whom the FBG and BP have been assessed within the preceding 12 months are shown in table 25. Although patients should be seen at least three times a year, where FBG and BP are assessed routinely each time, more than one third of patients had no records of FBG or BP in the preceding 12 months. Only 31.4% of patients had three or more records of FBG and 37.9% had three or more records of BP. These low proportions indicate that the compliance of patients to attend their routine appointments is poor. This suggests that there is a need to improve the current appointment system and the compliance of patients to attend their follow-up appointments at the diabetes mini clinics in the PHCCs.

**Figure 28: Proportions of patients who visited the diabetes clinics at the PHCCs during the preceding 6 months, 2011**

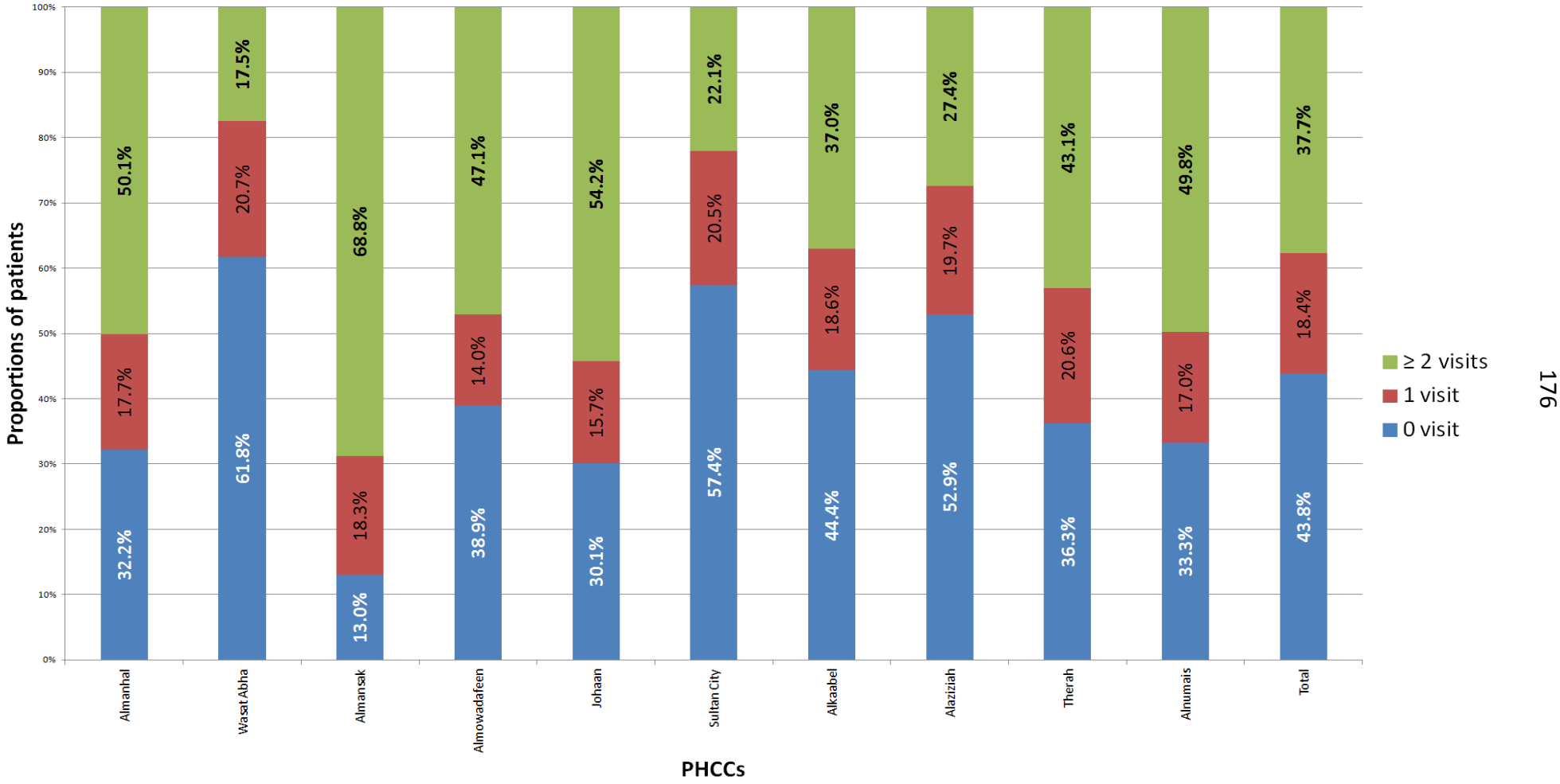


**Table 25: Proportions of patients with diabetes who have been assessed within the last year for FBG and BP**

| Indicator | Number | % |
|---|---|---|
| **FBG, (/4458)** | | |
| No record of FBG | 1766 | 39.6 |
| One record of FBG | 791 | 17.7 |
| Two records of FBG | 503 | 11.3 |
| Three or more records of FBG | 1398 | 31.4 |
| **BP, (/4458)** | | |
| No record of BP | 1574 | 35.3 |
| One record of BP | 748 | 16.8 |
| Two records of BP | 448 | 10.0 |
| Three or more records of BP | 1688 | 37.9 |

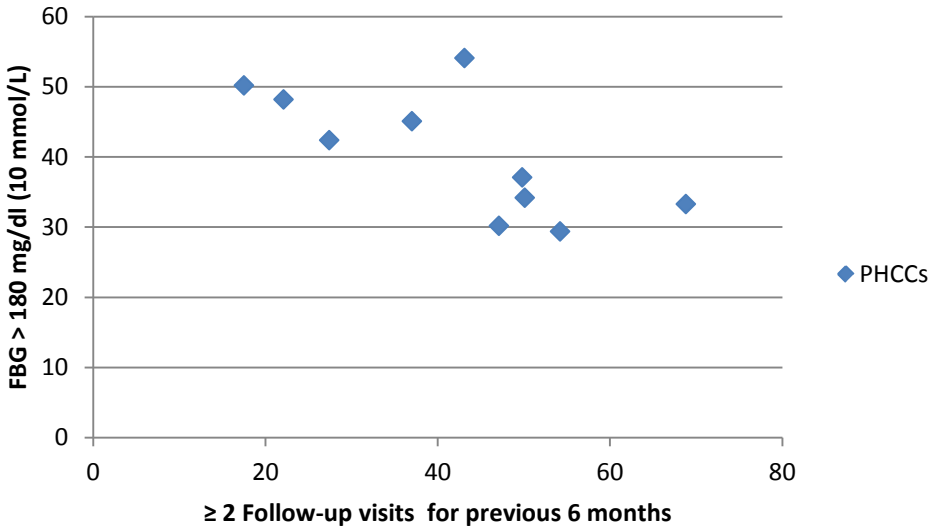
As shown in table 26, the proportion of poor glycemic control dropped from almost 50% among those patients who have not visited their diabetes clinic during the preceding 6 months to 36.8% among those patients who visited the diabetes clinic 2 times or more during the preceding 6 months.

**Table 26: The distribution of the FBG by number of follow-up visits during the preceding 6 months**

| **Number of follow-up visits** | **Mean FBG categories** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Excellent** < 126 mg/dl (7mmol/l) | | **Acceptable** 126 - 180 mg/dl (7-10 mmol/l) | | **Poor** > 180 mg/dl (10 mmol/l) | | **Total** | |
| | No. | *%* | No. | *%* | No. | *%* | No. (FBG) | *%* |
| **0 Visit** | 73 | *17.0* | 144 | *33.6* | 212 | *49.4* | 429 *(196.8)* | *100* |
| **1 Visit** | 147 | *21.5* | 247 | *36.2* | 289 | *42.3* | 683 *(182.3)* | *100* |
| **≥ 2 visits (Ideal)** | 316 | *20.0* | 683 | *43.2* | 581 | *36.8* | 1580 *(173.1)* | *100* |

When comparing the PHCCs, as the proportion of patients who visited their diabetes mini-clinics ≥ 2 times in the preceding 6 months rises, the proportion of patients with FBG > 180 mg/dl declines (Figure 29).

**Figure 29: The relationship between follow-up visits and FBG among the PHCCs**




***Health education process:***

*PHCCs:*

Health education is an essential part of successful diabetes care. Assessing the best health education checklist sheet for each patient showed that the health education programme was not implemented properly. The programme contained 13 topics that cover the important aspects of diabetes care. The first 5 topics in the list were explained to almost two thirds of patients (Table 28). The role of exercise and how to take care of feet were explained to more than half of the patients. The other topics were explained to a proportion of patients ranging from 24 to 30%. Johaan and Alnumais PHCCs were implementing the health education programme better than the

other PHCCs. Wasat Abha and Therah were poorly implementing the programme (Figure 30).

It was expected that provision of health education would improve the glycemic control. However, those patients who received education for more topics were less likely to have excellent glycemic control (Table 27).

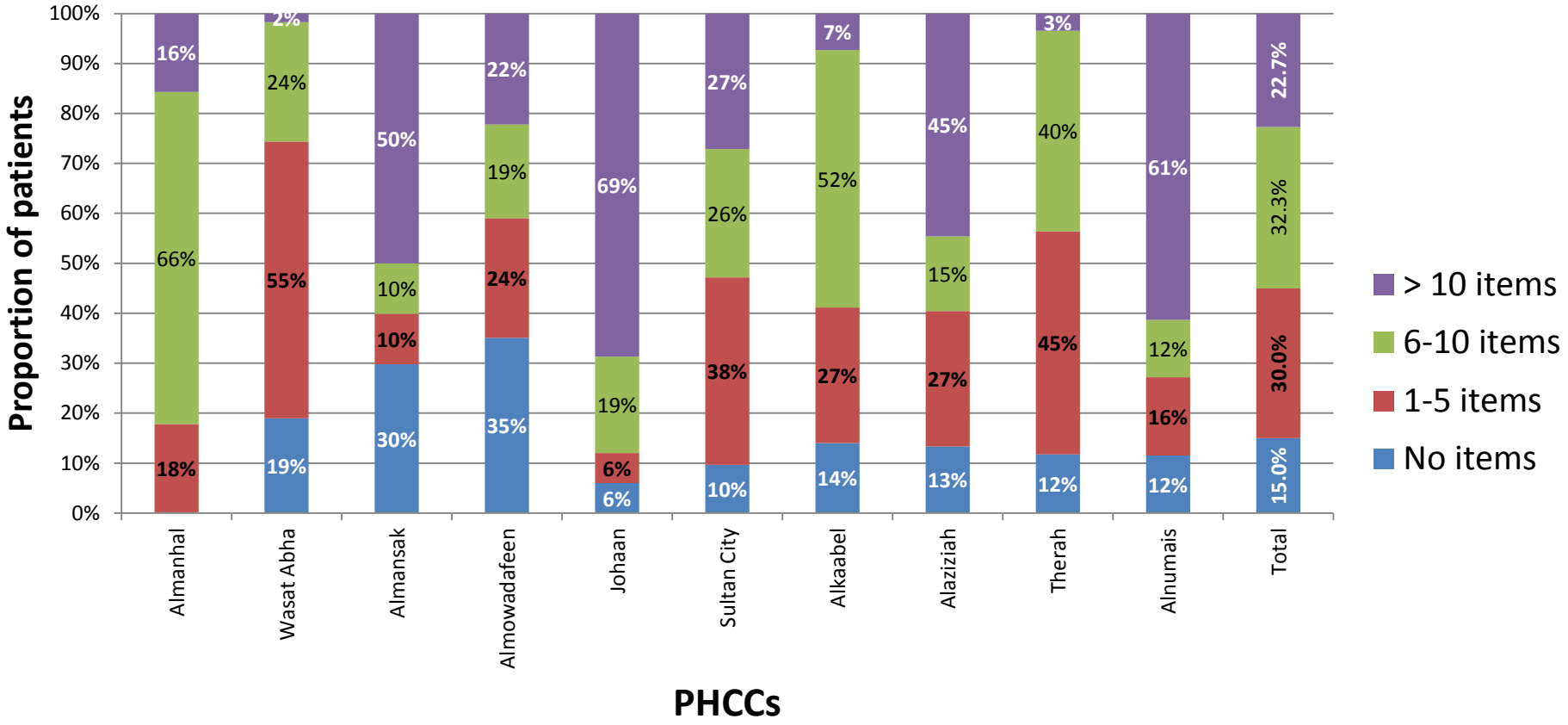
**Table 27: Number of health education topics given to patients by degree of glycemic control in PHCCs**

| Number of explained topics | FBG categories | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Excellent | | Acceptable | | Poor | | Total | |
| | < 126 mg/dl (7mmol/l) | | 126 - 180 mg/dl (7-10 mmol/l) | | > 180 mg/dl (10 mmol/l) | | | |
| | No. | % | No. | % | No. | % | No. | % |
| **No topics** | 82 | *25.8* | 130 | *40.9* | 106 | *33.3* | 318 | *100* |
| **1-5 topics** | 132 | *20.1* | 229 | *34.9* | 295 | *45.0* | 656 | *100* |
| **6-10 topics** | 183 | *18.3* | 414 | *41.4* | 404 | *40.4* | 1001 | *100* |
| **> 10 topics** | 139 | *19.4* | 301 | *42.0* | 277 | *38.6* | 717 | *100* |

## Table 28: The proportions of patients who received education by topics and PHCCs

| Health education topics | PHCCs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Almanhal | Wasat Abha | Almansak | Almowa dafeen | Johaan | Sultan City | Alkaabel | Alaziziah | Therah | Alnumais | **Total** |
| | % (/668) | % (/796) | % (/208) | % (/527) | % (/83) | % (/498) | % (/700) | % (/314) | % (/204) | % (/460) | % (/4458) |
| **Explanation of diabetes** | 94.0 | 73.4 | 66.8 | 62.6 | 94.0 | 87.1 | 84.6 | 81.2 | 77.0 | 88.0 | **80.8** |
| **Provision and use of diabetes card** | 99.6 | 74.6 | 65.4 | 57.7 | 94.0 | 71.3 | 84.3 | 67.2 | 64.7 | 87.0 | **77.7** |
| **Explanation of anti-diabetic drugs** | 83.5 | 57.3 | 63.0 | 46.9 | 92.8 | 66.1 | 55.6 | 62.4 | 59.8 | 85.9 | **65.1** |
| **Understanding hypoglycaemia** | 76.0 | 46.9 | 63.5 | 50.3 | 83.1 | 65.3 | 67.4 | 65.6 | 52.5 | 77.6 | **63.1** |
| **Role of diet** | 85.0 | 52.6 | 64.4 | 48.0 | 91.6 | 64.3 | 72.1 | 63.4 | 56.9 | 75.2 | **65.9** |
| **Seeking medical aid in illness** | 21.0 | 8.7 | 47.6 | 30.6 | 78.3 | 40.2 | 15.9 | 53.5 | 10.3 | 71.7 | **30.6** |
| **Urinalysis and urine dipsticks at home** | 19.5 | 6.7 | 51.0 | 27.3 | 15.7 | 35.9 | 12.0 | 47.8 | 7.8 | 69.8 | **26.8** |
| **Care of feet** | 83.5 | 37.3 | 60.1 | 39.5 | 79.5 | 49.6 | 58.9 | 64.0 | 52.0 | 68.9 | **56.9** |
| **Risk of smoking** | 20.5 | 6.8 | 53.4 | 28.5 | 63.9 | 36.3 | 21.9 | 56.7 | 17.2 | 66.7 | **30.5** |
| **Role of Exercise** | 84.4 | 18.7 | 61.5 | 34.0 | 81.9 | 55.6 | 49.9 | 58.6 | 59.8 | 63.5 | **51.9** |
| **Blood glucose measurement technique** | 18.7 | 3.1 | 56.3 | 24.1 | 78.3 | 30.7 | 11.7 | 52.9 | 11.3 | 62.0 | **26.2** |
| **Patients' home monitoring chart** | 16.5 | 2.0 | 51.4 | 23.0 | 73.5 | 25.1 | 12.9 | 47.8 | 9.3 | 60.4 | **24.2** |
| **Special circumstances** | 16.2 | 1.8 | 8.7 | 24.9 | 72.3 | 16.1 | 52.9 | 45.2 | 12.3 | 55.7 | **27.0** |

**Figure 30: The delivery of health education programme in diabetes mini-clinics at PHCCs by number of topics**



*ADC:*

As illustrated in table 29, the topics of the health education programme at ADC were slightly different from the primary healthcare programme. Data from this table can be compared with the data in table 28 which shows that the health education programme for patients with diabetes was better implemented at the primary healthcare level than at ADC. It is apparent from this table that the implementation of the health education programme at ADC is far from satisfactory for most of its topics and it needs to be improved.

**Table 29: The proportions of patients who received education by topics at ADC**

| Health education topics | No. | % (/551) |
|---|---|---|
| Explanation of diabetes | 271 | 49.2 |
| Hypoglycaemia & hyperglycaemia | 245 | 44.5 |
| Diabetic card provision | 233 | 42.3 |
| What is insulin? | 226 | 41.0 |
| Role of diet | 364 | 66.1 |
| Role of exercise | 217 | 39.4 |
| Oral anti-diabetic drugs | 207 | 37.6 |
| Self monitoring of blood glucose | 341 | 61.9 |
| Special issues and circumstances | 125 | 22.7 |
| Complications of diabetes | 157 | 28.5 |
| Roles of bad habits such as smoking & overeating | 125 | 22.7 |
| Role of hygiene: foot care, eye care & other hygiene | 216 | 39.2 |

***Completeness of patients' records and recording:***

*PHCCs:*

Recording details of patient's management, investigations and care outcomes in the medical records is important. It supports informed decision making, effective communication between healthcare professionals and delivering of good follow-up care. The patient's records are a valuable source of data and information for scientific research, audit and healthcare service evaluation. The completeness of recording the

required information in each sheet of the patient's records was assessed. Structured questions were used to assess each sheet in the record to decide whether the presence of the required information was complete, partly complete or the sheet was not available in the record.

In each sheet, specific information should be recorded. If all the information were recorded then the sheet is completely filled in. If any information was missed then the sheet is partly filled in or completed.

As shown in table 30, the completeness of recording information was variable among PHCCs for each sheet in the patients' records. The most completed sheet was the bio-data sheet (76.2%) followed by the annual referral sheet (60.5%). The recording of information in the other sheets was mainly partly completed. There were many records with some sheets missing (absent sheet). The most common unavailable sheet was the hospital feedback sheet (21.6%) and the annual referral sheet (11.9%).

*ADC:*

At ADC (Table 31), the progress form was the most frequently completed form (92.9%). All the other sheets were often partly completed. The most common unavailable sheet was the diet plan assessment sheet (2.0%).

***Recording patient compliance:***

There are four types of compliance that can be recorded in the diabetes follow-up chart (diet, exercise, appointment and drug compliance). At ADC, these four types of compliance are not recorded routinely. At the primary healthcare level, Almanhal

PHCC was the best centre at recording the degree of patient compliance; notes about compliance in the preceding 12 months were missing in only 29% of records of patients with diabetes. Five PHCCs do not record compliance routinely (Wasat Abha, Almowadafeen, Sultan City, Alaziziah, and Therah). The other four PHCCs are poor at recording the patient compliance. Therefore, the data on compliance were not presented here.

## Table 30: Completeness of record's sheets of patients with diabetes in the mini-clinic of each PHCC

| Record's sheets | completeness of recording | PHCCs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Almanhal | Wasat Abha | Almansak | Almowadafeen | Johaan | Sultan City | Alkaabel | Alaziziah | Therah | Alnumais | Total |
| | | % (/668) | % (/796) | % (/208) | % (/527) | % (/83) | % (/498) | % (/700) | % (/314) | % (/204) | % (/460) | % (/4458) |
| **Bio-data Sheet** | **Completed** | **99.1** | **60.6** | **80.8** | **92.6** | **75.9** | **49.4** | **68.3** | **96.8** | **63.7** | **82.0** | **76.2** |
| | Partly completed | 0.1 | 36.2 | 14.4 | 7.4 | 24.1 | 49.6 | 31.0 | 2.5 | 35.3 | 16.1 | **22.3** |
| | Absent | 0.3 | 0.3 | 2.4 | 0.0 | 0.0 | 0.2 | 0.3 | 0.0 | 1.0 | 0.2 | **0.3** |
| | Missed | 0.4 | 3.0 | 2.4 | 0.0 | 0.0 | 0.8 | 0.4 | 0.6 | 0.0 | 1.7 | **1.1** |
| **Complication sheet** | **Completed** | **96.3** | **12.8** | **59.6** | **2.7** | **18.1** | **86.7** | **31.6** | **24.2** | **22.5** | **66.5** | **44.4** |
| | Partly completed | 3.7 | 83.5 | 29.8 | 94.3 | 81.9 | 11.0 | 65.6 | 7.6 | 39.7 | 31.5 | **46.7** |
| | Absent | 0.0 | 2.6 | 9.1 | 0.8 | 0.0 | 1.4 | 1.6 | 66.9 | 0.5 | 0.7 | **6.2** |
| | Missed | 0.0 | 1.0 | 1.4 | 2.3 | 0.0 | 0.8 | 1.3 | 1.3 | 37.3 | 1.3 | **2.7** |
| **The most recent annual referral sheet** | **Completed** | **100.0** | **27.8** | **53.4** | **69.6** | **32.5** | **89.2** | **56.6** | **51.0** | **46.1** | **45.9** | **60.5** |
| | Partly completed | 0.0 | 55.9 | 24.0 | 23.0 | 24.1 | 5.2 | 33.3 | 22.0 | 27.5 | 32.6 | **26.2** |
| | Absent | 0.0 | 15.2 | 20.7 | 6.5 | 43.4 | 4.2 | 9.6 | 23.2 | 24.5 | 18.9 | **11.9** |
| | Missed | 0.0 | 1.1 | 1.9 | 0.9 | 0.0 | 1.4 | 0.6 | 3.8 | 2.0 | 2.6 | **1.3** |
| **The most recent diabetes follow-up chart** | **Completed** | **8.4** | **20.9** | **63.0** | **4.7** | **30.1** | **10.0** | **60.7** | **90.8** | **7.8** | **5.7** | **27.0** |
| | Partly completed | 91.6 | 77.5 | 30.8 | 93.4 | 68.7 | 87.8 | 37.1 | 7.6 | 89.7 | 92.0 | **71.1** |
| | Absent | 0.0 | 0.8 | 2.9 | 0.4 | 1.2 | 1.0 | 0.6 | 0.3 | 0.5 | 0.2 | **0.6** |
| | Missed | 0.0 | 0.9 | 3.4 | 1.5 | 0.0 | 1.2 | 1.6 | 1.3 | 2.0 | 2.2 | **1.3** |
| **The most recent Hospital feedback** | **Completed** | **0.3** | **22.1** | **46.2** | **2.5** | **4.8** | **5.4** | **8.7** | **17.8** | **4.4** | **2.4** | **10.2** |
| | Partly completed | 91.8 | 54.0 | 29.3 | 65.8 | 73.5 | 61.8 | 74.7 | 43.9 | 60.3 | 82.6 | **66.9** |
| | Absent | 7.9 | 22.6 | 21.2 | 31.3 | 21.7 | 31.3 | 15.9 | 35.0 | 33.3 | 12.6 | **21.6** |
| | Missed | 0.0 | 1.3 | 3.4 | 0.4 | 0.0 | 1.4 | 0.7 | 3.2 | 2.0 | 2.4 | **1.3** |
| **The best education checklist sheet (any date)** | **Completed** | **10.6** | **9.9** | **38.0** | **6.6** | **34.9** | **13.5** | **8.9** | **43.0** | **5.4** | **52.6** | **18.2** |
| | Partly completed | 89.4 | 79.6 | 49.0 | 75.7 | 62.7 | 80.7 | 87.4 | 43.3 | 86.8 | 44.3 | **74.4** |
| | Absent | 0.0 | 8.8 | 12.0 | 15.7 | 2.4 | 4.0 | 1.3 | 13.1 | 4.4 | 0.4 | **5.9** |
| | Missed | 0.0 | 1.6 | 1.0 | 1.9 | 0.0 | 1.8 | 2.4 | 0.6 | 3.4 | 2.6 | **1.6** |

Table 31: Completeness of record's sheets of patients with diabetes in the ADC

| Record's sheets | completeness of recording | No. | % (/551) |
|---|---|---|---|
| **Bio-data information sheet** | Completed | 167 | 30.3 |
| | Partly completed | 377 | 68.4 |
| | Absent sheet | 2 | 0.4 |
| | Missed data | 5 | 0.9 |
| **Complication sheet** | Completed | 103 | 18.7 |
| | Partly completed | 419 | 76.0 |
| | Absent sheet | 1 | 0.2 |
| | Missed data | 28 | 5.0 |
| **Progress note form** | Completed | 512 | 92.9 |
| | Partly completed | 31 | 5.6 |
| | Absent sheet | 1 | 0.2 |
| | Missed data | 7 | 1.3 |
| **Last diabetes follow-up sheet** | Completed | 8 | 1.5 |
| | Partly completed | 499 | 90.6 |
| | Absent sheet | 7 | 1.3 |
| | Missed data | 37 | 6.7 |
| **Diabetic eye file** | Completed | 59 | 10.7 |
| | Partly completed | 475 | 86.2 |
| | Absent sheet | 4 | 0.7 |
| | Missed data | 13 | 2.4 |
| **Diabetes education programme** | Completed | 80 | 14.5 |
| | Partly completed | 428 | 77.7 |
| | Absent sheet | 4 | 0.7 |
| | Missed data | 39 | 7.1 |
| **Diabetic foot registry** | Completed | 125 | 22.7 |
| | Partly completed | 417 | 75.7 |
| | Absent sheet | 1 | 0.2 |
| | Missed data | 8 | 1.5 |
| **Diabetic foot progress sheet** | Completed | 196 | 35.6 |
| | Partly completed | 325 | 59.0 |
| | Absent sheet | 2 | 0.4 |
| | Missed data | 28 | 5.1 |
| **Nursing diabetic assessment** | Completed | 62 | 11.3 |
| | Partly completed | 467 | 84.8 |
| | Absent sheet | 7 | 1.3 |
| | Missed data | 15 | 2.7 |
| **Diet plan assessment** | Completed | 102 | 18.5 |
| | Partly completed | 400 | 72.6 |
| | Absent sheet | 11 | 2.0 |
| | Missed data | 38 | 6.9 |

***Variation of process measures among PHCCs:***

The variation in diabetes management between PHCCs was explored by comparing process measures (Table 32). A colour coding was used to show the best 3 PHCCs (green in colour) and the poorest 3 PHCCs (red in colour) for each measure. All the processes of diabetes care in all the PHCCs need to be improved.

Generally, the lab tests were commonly done for cholesterol, triglycerides and creatinine in addition to the ECG. But, all the clinical examinations were done less frequently and showed marked variation between PHCCs. There was marked variation between individual PHCCs in referring patients to hospital for annual review, measuring FBG, assessing the cardiovascular system, nervous system eye and foot examination. For example, the variation between individual PHCCs in the proportion of patients receiving FBG test ranged from 88% in one PHCC to 28% in another PHCC. Eye examination was done and recorded for 72% of people with diabetes in one PHCC but only for 28% in another. The most striking result to emerge from the table 32 is that foot examination was done and recorded for only 5.6% of people with diabetes. In addition, foot examination also showed marked variation which ranged from almost 1% in one PHCC to 47% in another.

Across all the measures, Wasat Abha, Sultan city and Alaziziah PHCCs were the poorest centres (red) in carrying out and recording these healthcare checks while Almanhal, Almansak, Alnumais and Almowadafeen PHCCs were the best (green).

## Table 32: Process measures of diabetes care in the PHCCs

| *Indicators, % (denominator)* | Almanhal | Wasat Abha | Almansak | Almowa dafeen | Johaan | Sultan City | Alkaabel | Alaziziah | Therah | Alnumais | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***FBG measured (PHCCs)**** | 76.5 (668) | 28.8 (796) | 88.0 (208) | 59.8 (527) | 61.4 (83) | 40.0 (498) | 79.9 (700) | 52.5 (314) | 71.6 (204) | 72.6 (460) | **60.4 (4458)** |
| ***Blood pressure measured (PHCCs)**** | 76.3 (668) | 63.4 (796) | 91.8 (208) | 65.5 (527) | 73.5 (83) | 50.6 (498) | 80.9 (700) | 54.1 (314) | 72.5 (204) | 76.3 (460) | **64.7 (4458)** |
| ***Referral for hospital review in 2011*** | 61.3 (666) | 21.8 (730) | 67.3 (199) | 59.5 (518) | 59.0 (83) | 18.8 (483) | 48.3 (675) | 26.5 (310) | 51.2 (201) | 62.2 (457) | **45.0 (4322)** |
| ***FBG or RBG measured (Hospital)***** | 96.4 (608) | 73.2 (795) | 84.4 (205) | 87.5 (527) | 98.6 (73) | 64.6 (497) | 84.7 (678) | 61.8 (314) | 65.7 (204) | 88.5 (460) | **80.3 (4361)** |
| ***Blood pressure measured (Hospital)***** | 37.9 (607) | 47.0 (789) | 67.8 (205) | 69.1 (527) | 67.1 (73) | 42.3 (497) | 76.4 (682) | 44.4 (313) | 45.1 (204) | 51.7 (460) | **54.0 (4357)** |
| ***HbA1c measured***** | 1.3 (608) | 1.8 (791) | 27.4 (197) | 4.4 (527) | 9.6 (73) | 2.0 (497) | 3.1 (677) | 1.6 (313) | 1.0 (204) | 7.0 (460) | **4.0 (4347)** |
| ***Cholesterol measured***** | 97.4 (607) | 71.1 (796) | 85.0 (206) | 85.0 (526) | 93.2 (73) | 61.6 (498) | 82.9 (678) | 61.0 (313) | 67.2 (204) | 87.0 (460) | **79.0 (4361)** |
| ***Triglycerides measured***** | 94.2 (608) | 65.6 (790) | 79.5 (200) | 80.0 (526) | 83.3 (72) | 58.8 (497) | 81.2 (674) | 58.6 (307) | 66.7 (204) | 85.4 (460) | **75.6 (4338)** |
| ***Creatinine measured***** | 96.4 (608) | 69.9 (791) | 75.6 (197) | 83.1 (526) | 89.0 (73) | 61.3 (494) | 81.5 (677) | 58.7 (310) | 66.7 (204) | 86.5 (460) | **77.4 (4340)** |
| ***Cardiovascular system assessed***** | 35.7 (603) | 45.3 (795) | 67.3 (202) | 43.8 (527) | 37.5 (72) | 22.5 (498) | 57.0 (677) | 31.4 (312) | 51.0 (204) | 42.8 (460) | **42.9 (4350)** |
| ***Nervous system assessed***** | 29.6 (608) | 43.6 (795) | 65.3 (202) | 43.3 (527) | 27.0 (74) | 8.1 (493) | 47.4 (675) | 29.3 (314) | 49.5 (204) | 43.5 (460) | **38.1 (4352)** |
| ***Eye examination***** | 66.9 (608) | 50.4 (7890 | 72.4 (203) | 57.9 (527) | 45.9 (74) | 34.2 (494) | 60.6 (675) | 28.7 (314) | 46.6 (204) | 58.9 (460) | **53.5 (4348)** |
| ***Foot examination***** | 3.9 (609) | 2.3 (795) | 47.5 (200) | 0.9 (527) | 6.8 (74) | 4.4 (498) | 4.9 (679) | 6.7 (312) | 5.4 (204) | 2.0 (460) | **5.6 (4358)** |
| ***ECG***** | 94.4 (606) | 66.9 (792) | 82.4 (204) | 82.9 (527) | 73.9 (69) | 60.4 (497) | 81.4 (677) | 57.7 (312) | 63.5 (203) | 85.6 (459) | **76.2 (4346)** |

**The test or measure was done in the PHCC in the previous 12 months*

***The test or measure was done in the hospital; the most recent result was collected at any time (not only in the previous 12 months)*

### 6.4.3. Outcomes of diabetes care

It is essential that everyone with diabetes receives all the healthcare checks according to the local guideline. It is just as important that people with diabetes achieve the recommended targets. This will minimise the risk of future diabetes complications. In adults with diabetes the recommended outcome targets for both national and local guidelines were summarized in table 33.

**Table 33: Summary of the targets of some outcome measures**

| Outcome indictors | Local guideline[214] | | National manual[200] | |
|---|---|---|---|---|
| | Target value | Target patient % | Target value | Target patient % |
| Fasting blood glucose (FBG) | ≤ 130 mg/dl (recommended) | -- | < 126 mg/dl (Excellent control) | > 40% |
| | < 126 mg/dl (good control) | ≥ 40% | 126-180 mg/dl (Acceptable control) | -- |
| | 126-140 mg/dl (Fair control) | 40% | > 180mg/dl (Poor control) | < 10% |
| | > 140 mg/dl (poor control) | < 20% | -- | -- |
| Random blood glucose (RBG) | ≤ 180 mg/dl | -- | -- | -- |
| Glycated haemoglobin (HbA1c) | < 7.0% (recommended) | -- | < 8.0% (Excellent control) | >40% |
| | -- | -- | 8-11% (Acceptable control) | -- |
| | -- | -- | >11% (Poor control) | < 10% |
| Blood pressure (BP) | < 130/80 mm Hg (recommended) | ≥ 80% | -- | -- |
| Body mass index (BMI) | Normal | > 50% | -- | -- |
| | Overweight | < 30% | -- | -- |
| | Obese | < 20% | -- | -- |
| Cholesterol | -- | -- | -- | -- |
| Triglycerides | < 150 mg/dl (recommended) | -- | -- | -- |

The outcomes of diabetes care in Abha city need to be improved. Only 23% of people with diabetes achieved the recommended FBG target of ≤ 130 mg/dl (7.2 mmol/l). In addition, according the local guideline 68.6% of patients had poor glycemic control of > 140 mg/dl (7.8 mmol/l) and according to the national guideline, 40% of patients had poor glycemic control of > 180 mg/dl (10 mmol/l). The FBG tests that were conducted in hospitals during the annual review confirmed the poor glycemic control and showed similar or even higher proportions.

***Overview of outcome measures:***

*PHCCs:*

At the primary healthcare level, there were widespread deficiencies in diabetes care processes and clinical outcomes. In adult patients (≥ 20 years) with diabetes, 33.3% (1263/3796) were overweight and 53% (2014/3796) were obese. They had a mean BMI of 31 kg/$m^2$ which is within the obesity range. Thirty one percent of patients with a recorded BMI and type 1 diabetes and 33.4% of those with a recorded BMI and type 2 diabetes were overweight (BMI 25-29.9 kg/$m^2$), while 36.2% of those with type 1 and 54.5% of those with type 2 were obese (BMI ≥ 30 kg/$m^2$). In this study, the proportion of obese patients among all patients with diabetes was higher than the proportion of overweight patients (45.3% versus 28.4% respectively), (denominator = 4458).

The mean BP of patients from the PHCCs was within the recommended target (≤ 130/80 mmHg), while the mean fasting and random blood glucose were higher than the recommended targets (≤ 130 mg/dl) or (≤ 7.2mmol/l) for FBG and (≤ 180 mg/dl) or (≤ 10 mmol/l) for RBG (Table 34). The proportions of patients with mean FBG ≥ 130

mg/dl among males and females were similar (77.1% and 77.3% respectively). However, when different PHCCs are compared, Therah and Sultan city PHCCs had the highest proportions of patients with mean FBG ≥ 130 mg/dl (84.2% and 81.4% respectively). Therah, Sultan city in addition to Wasat Abha PHCCs were having also the highest proportions of patients with poor glycemic control of mean FBG > 180 mg/dl (54.1%, 50.2%, and 48.2% respectively).

**Table 34: Outcome indicators of diabetes care among adults (≥20 years) using the most recent readings of routine follow-up investigations at the PHCCs**

| Indicators | Number of patients | Mean | Std. Deviation |
|---|---|---|---|
| **Body mass index, BMI (Kg/m²)** | 3796 | **31.03** | 6.63 |
| **Blood pressure, BP (mmHg)** | | | |
| ***Systolic BP*** | 2848 | **124.77** | 17.74 |
| ***Diastolic BP*** | 2848 | **77.53** | 10.28 |
| **Fasting blood glucose, FBG (mg/dl)** | 2655 | **179.46** | 71.39 |
| **Random blood glucose, RBG (mg/dl)** | 72 | **251.50** | 98.16 |

T1DM patients were at a higher risk of having FBG above the recommended target (> 130 mg/dl) than T2DM patients (odds ratio (OR) = 2.03, 95% CI: 1.4-2.9, P < 0.0005). T1DM patients were also at a greater risk of not being referred to hospital for annual checkups than patients with T2DM (OR = 1.4, 95% CI: 1.1-1.6, P < 0.001).

The annual hospital clinical examinations and lab investigations confirmed what happens in PHCCs (Table 35). Furthermore, the mean of the annual readings of FBG and RBG that were conducted at AGH lab were higher than those at the PHCC's lab. Of those patients who have had a HbA1c test at hospital (161 patients), 82.6% had a reading higher than 7.5% (Table 36). The mean value of HbA1c for 156 available readings for adult patients was higher (11.5%) than the target for glycemic control (< 7.0%). Mean creatinine was within the normal range (0.5 – 1.4 mg/dl) whereas mean

cholesterol and triglycerides were higher than the target values (< 156 mg/dl or < 4 mmol/l for cholesterol and < 150 mg/dl or < 1.7 mmol/l for triglycerides) as shown in table 35.

**Table 35: Some outcome indicators of diabetes care among adults (≥ 20 years) using the most recent readings of annual hospital investigations at AGH**

| Indicators | Number of patients | Mean | Std. deviation |
|---|---|---|---|
| **Blood pressure, BP (mmHg)** | | | |
| ***Systolic BP*** | 2292 | **125.66** | 16.25 |
| ***Diastolic BP*** | 2292 | **78.24** | 8.95 |
| **Fasting blood glucose, FBG (mg/dl)** | 3418 | **196.31** | 78.04 |
| **Random blood glucose, RBG (mg/dl)** | 1524 | **282.47** | 97.35 |
| **HbA1C, %** | 156 | **11.53** | 4.90 |
| **Creatinine, mg/dl** | 3343 | **1.02** | 2.78 |
| **Cholesterol, mg/dl** | 3412 | **195.63** | 46.32 |
| **Triglycerides, mg/dl** | 3262 | **183.53** | 101.01 |

Of those patients who have had their FBG measured in the preceding 12 months at their PHCCs (Table 36), 77% have a mean reading that is more than 130 mg/dl. Almost 78% of those patients who have had their BP measured in the preceding 12 months have a reading of 130/80 or less. Of patients who have a record of having their cholesterol measured, 52.7% have a reading of 195 mg/dl (5 mmol/l) or less.

**Table 36: Proportions of patients with raised values for some outcome indicators of diabetes care in PHCCs**

| Indicators | Number | % |
|---|---|---|
| **Fasting blood glucose, FBG, (/2692):** the mean reading for the preceding 12 months | | |
| FBG ≤ 130 mg/dl | 617 | 22.9 |
| FBG > 130 mg/dl | 2075 | 77.1 |
| **HbA1c, (/161)** | | |
| HbA1c ≤ 7.5% | 28 | 17.4 |
| HbA1c > 7.5% | 133 | 82.6 |
| **Blood pressure, BP, (/2884):** the most recent reading in the preceding 12 months | | |
| BP ≤ 130/80 | Systolic 2243<br>Diastolic 2272 | 77.8<br>78.8 |
| BP > 130/80 | Systolic 641<br>Diastolic 612 | 22.2<br>21.2 |
| **Cholesterol, (/3447):** the most recent reading | | |
| ≤ 156 mg/dl (4 mmol/l) | 646 | 18.7 |
| > 156 mg/dl (4 mmol/l) | 2801 | 81.3 |
| ≤ 195 mg/dl (5 mmol/l) | 1817 | 52.7 |
| > 195 mg/dl (5 mmol/l) | 1630 | 47.3 |

*ADC:*

The sample of adult patients that were reviewed at ADC had similar unsatisfactory outcome indicators. However, in general, the mean values of these indicators were slightly better than the corresponding values at the PHCCs (Table 37 and 38).

**Table 37: Outcome indicators of diabetes care among adults (≥ 20 years) using the most recent readings of follow-up investigations at the ADC during the last 12 months**

| Indicators | Number of patients | Mean | Std. Deviation |
|---|---|---|---|
| **Body mass index, BMI (Kg/m²)** | 420 | **30.79** | 6.516 |
| **Blood pressure, BP (mmHg)** | | | |
| ***Systolic** BP* | 435 | **122.33** | 15.48 |
| ***Diastolic** BP* | 435 | **77.00** | 9.685 |
| **Fasting blood glucose, FBG (mg/dl)** | 244 | **168.89** | 67.87 |
| **Random blood glucose, RBG (mg/dl)** | 172 | **239.49** | 88.98 |
| **HbA1C, %** | 339 | **9.086** | 2.091 |
| **Creatinine, mg/dl** | 281 | **0.89** | 0.545 |
| **Cholesterol, mg/dl** | 235 | **181.84** | 43.68 |
| **Triglycerides, mg/dl** | 239 | **143.94** | 76.11 |

**Table 38: Proportions of patients with raised values for some outcome indicators of diabetes care in ADC**

| Indicators | Number | % |
|---|---|---|
| **Fasting blood glucose , FBG, (/269):** the mean of the readings for the preceding 12 months | | |
| FBG ≤ 130 mg/dl | 86 | 32.0 |
| FBG > 130 mg/dl | 183 | 68.0 |
| **HbA1c, (/403)** | | |
| HbA1c ≤ 7.5% | 94 | 23.3 |
| HbA1c > 7.5% | 309 | 76.7 |
| **Blood pressure, BP, (/287):** the most recent reading in the preceding 12 months | | |
| BP ≤ 130/80 | Systolic 406<br>Diastolic 401 | 83.4<br>82.3 |
| BP > 130/80 | Systolic 81<br>Diastolic 86 | 16.6<br>17.7 |
| **Cholesterol, (/257):** the most recent reading | | |
| ≤ 156 mg/dl (4 mmol/l) | 83 | 32.3 |
| > 156 mg/dl (4 mmol/l) | 174 | 67.7 |
| ≤ 195 mg/dl (5 mmol/l) | 164 | 63.8 |
| > 195 mg/dl (5 mmol/l) | 93 | 36.2 |

***Variation of outcome measures among PHCCs:***

The variation of diabetes care outcome between PHCCs was explored by comparing some outcome measures (Table 39). As shown in these tables, a colour coding was used to show the best 3 PHCCs (green in colour) and the poorest 3 PHCCs (red in colour) for achieving the recommended target for each measure.

The variation between individual PHCCs in the proportion of patients with poor glycemic control was small. Also the variation was small between individual PHCCs in the proportion of patients with obesity, cholesterol > 156 mg/dl (4 mmol/l) or triglycerides ≥ 150 mg/dl (1.7 mmol/l).

By comparing the PHCCs and their process and outcome measures (Table 32 and 39), those PHCCs which had the poorest process measures (Wasat Abha, Sultan city and

Alaziziah PHCCs) also had the poorest outcome measures. Similarly, those PHCCs with good process measures such as Almanhal, Almansak and Almowadafeen also had the best outcome measures.

## Table 39: Proportions of outcome measures of diabetes care in the PHCCs

| *Indicators, % (denominator)* | Almanhal | Wasat Abha | Almansak | Almowa dafeen | Johaan | Sultan City | Alkaabel | Alaziziah | Therah | Alnumais | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***FBG >130 mg/dl (PHCCs)**** | 74.4 (511) | 76.9 (229) | 77.0 (183) | 74.6 (315) | 76.5 (51) | 81.4 (199) | 78.2 (559) | 79.4 (165) | 84.2 (146) | 75.1 (334) | **77.1 (2692)** |
| ***FBG >180 mg/dl (PHCCs)**** | 34.2 (511) | 50.2 (229) | 33.3 (183) | 30.2 (315) | 29.4 (51) | 48.2 (199) | 45.1 (559) | 42.4 (165) | 54.1 (146) | 37.1 (334) | **40.2 (2692)** |
| ***FBG >130 mg/dl (Hospital)*** | 77.0 (583) | 84.5 (574) | 81.4 (172) | 78.0 (454) | 73.6 (72) | 82.3 (316) | 81.0 (564) | 74.5 (192) | 82.7 (133) | 79.5 (395) | **80.0 (3455)** |
| ***FBG >180 mg/dl (Hospital)*** | 43.1 (583) | 54.5 (574) | 50.0 (172) | 42.3 (454) | 48.6 (72) | 50.9 (316) | 52.0 (564) | 49.5 (192) | 48.1 (133) | 48.6 (395) | **48.7 (3455)** |
| ***HbA1c >7.5%**** | 85.7 (7) | 78.6 (14) | 94.2 (52) | 78.3 (23) | 100 (6) | 100 (7) | 81.3 (16) | 25.0 (4) | 100 (2) | 66.7 (30) | **82.6 (161)** |
| ***Systolic blood pressure > 130 mm Hg**** | 13.5 (510) | 34.5 (290) | 13.1 (191) | 23.2 (345) | 16.4 (61) | 17.9 (252) | 21.9 (566) | 53.5 (170) | 7.4 (148) | 24.5 (351) | **22.2 (2884)** |
| ***Diastolic blood pressure > 80 mm Hg**** | 19.4 (510) | 26.2 (290) | 15.7 (191) | 19.1 (345) | 14.8 (61) | 14.7 (252) | 19.3 (566) | 48.2 (170) | 8.1 (148) | 26.2 (351) | **21.2 (2884)** |
| ***BMI ≥ 30 (Kg/m²)**** | 50.1 (665) | 55.4 (466) | 50.3 (185) | 51.7 (491) | 50.6 (77) | 54.3 (446) | 51.1 (646) | 52.4 (225) | 53.5 (198) | 54.6 (452) | **52.5 (3851)** |
| ***Cholesterol* > 156 mg/dl (4 mmol/l) **** | 78.2 (592) | 84.1 (566) | 82.1 (173) | 79.4 (452) | 79.4 (68) | 78.5 (307) | 84.0 (563) | 80.1 (191) | 83.7 (135) | 81.8 (400) | **81.3 (3447)** |
| ***Cholesterol* > 195 mg/dl (5 mmol/l) **** | 38.9 (592) | 55.1 (566) | 43.4 (173) | 45.1 (452) | 42.6 (68) | 45.3 (307) | 52.9 (563) | 46.1 (191) | 50.4 (135) | 46.8 (400) | **47.3 (3447)** |
| ***Triglycerides ≥ 150 mg/dl (1.7 mmol/l) **** | 55.3 (570) | 60.3 (524) | 54.8 (157) | 56.2 (434) | 59.0 (61) | 57.4 (291) | 54.6 (553) | 56.2 (185) | 54.1 (133) | 54.5 (389) | **56.2 (3297)** |

**The test or measure was done in the PHCC in the previous 12 months*

***The test or measure was done in the hospital; the most recent result was collected at any time (not only in the previous 12 months)*

### *Diabetes complications:*

*PHCCs:*

The proportion of patients identified as having at least one of the complications of diabetes was 32.2%. Hypertension was the most common complication among patients with diabetes in Abha (22.5%), followed by diabetic retinopathy (10.5%), ischemic heart disease (2.9%), nephropathy (1.8%) and cerebrovascular disease (1.4%). The proportions of other complications of diabetes such as peripheral arterial disease, neuropathy and foot problems were almost lower than 1%. These low proportions might suggest that the screening and documenting of these complications is not appropriate at the level of primary healthcare. Identification of hypertension among patients with diabetes at the primary healthcare was not related to the number of follow-up visits during the preceding 6 months or the annual referral for checkups during the preceding 12 months.

*ADC:*

At ADC, the proportions of complications among the reviewed cases (551 patients) were higher than what has been observed at the PHCCs. Hypertension was also the most commonly reported complication, accounting for 31.6% of patients, followed by retinopathy (19.8%), ischemic heart disease (16.2%), foot problems (7.4%), neuropathy (3.8%), cerebrovascular disease (2.7%), and nephropathy (2.7%). The proportion of peripheral arterial disease was less than 1%.

## 6.5. Discussion

This comprehensive review of 97% (4458/4583) of the records of patients with diabetes in the 10 PHCCs of Abha city has identified several important findings. Variations in proportions of patients with T1DM and T2DM among the PHCCs were substantial. There was also large variation in the types of therapy prescribed for patients with diabetes among PHCCs. Glycemic control was poor among a large proportion of patients, and obesity was a common coexisting risk factor. Finally, the prevalence of diabetes complications was lower than expected.

### 6.5.1. *Variation of types of diabetes*

The proportion of patients with T1DM ranged from 3.5% at Alaziziah PHCC to almost 25% at Almowadafeen PHCC (Table 13). This large variation in the proportions of T1DM and T2DM among the PHCCs could be related to either misclassification of diabetes types or under-recognition of T2DM or both.

The misclassification explanation was supported by the fact that at Almowadafeen PHCC, almost all the T2DM patients are on oral therapy (94.3%) and all the T1DM patients are on insulin therapy. This might indicate that once the patient is treated by insulin or insulin combination, the clinicians misclassify his/her diabetes as T1DM. The other finding that supports the misclassification explanation is that about 48% of people with T1DM in Almowadafeen PHCC are on insulin plus oral combination therapy which is not routinely prescribed for T1DM patients. Therefore, it is likely that many patients with T2DM were misclassified as T1DM when insulin was added to their oral therapy. This is also supported by the age of T1DM patients. The proportions of

T1DM patients who were above 45 years old ranged from 35% to 59% except at Almowadafeen PHCC where 80% of them were above 45 years old. The question here is why this PHCC had the highest proportion of patients with T1DM who were above 45 years old. A possible explanation might be because the effect of misclassification.

Review of current local and national guidelines and protocols [200-202, 214, 216], identified that there was no agreement on specific criteria which clinicians can use to classify types of diabetes. Therefore, it is important to have a guideline that specifies the definition of type 1 and type 2 diabetes and agree on specific criteria for diagnosis of different types of diabetes to reduce the chance of misclassification.

As described in chapter 5, the prevalence of diabetes in Abha city was lower than the published national figures. Thus, it is likely that more than 70% of people with diabetes in Abha city are undiagnosed. T1DM typically presents in an abrupt manner with acute symptoms, such as ketoacidosis, weight loss, nausea, vomiting and polyuria, and the obvious need for insulin injections to control diabetes. Therefore, it is easy to identify and diagnose most of the patients with T1DM. However, there still few cases where it is ambiguous clinically whether someone has T1DM or T2DM. On the other hand, T2DM is typically of an insidious mild onset which may take many years to be diagnosed. Therefore, it is likely that the substantial undiagnosed diabetes is mostly T2DM. If there was variation between PHCCs in under-recognition of T2DM, this could cause a high proportion of T1DM in some PHCCs.

The under-recognition of T2DM explanation can be supported by the low and variable diabetes prevalence among different PHCCs and the probable large number of undiagnosed T2DM patients in Abha city. Therefore, it is important to implement

effectively the screening programme for diabetes to identify those undiagnosed patients. Also, it is important to implement interventions to increase the awareness of the whole population about symptoms and signs of diabetes.

### 6.5.2. *Variation in therapy prescribed*

Current prescribing practice in Saudi Arabia differs substantially from the United State of America (USA). In the USA, 58% of adult patients with diabetes are prescribed oral medications only compared to 63.7% in Abha city; 12% take insulin only versus 20.3% in Abha and 14% take both insulin and oral medication versus 9.9% in Abha. In the USA, about 16% were on no medication (diet and exercise) versus 3.3% in Abha.[255] Previous small sample size studies in Abha city reported a proportion of those who were on diet and exercise ranged from 8-10%.[246, 256] Thus, it seems that more Americans who are on diet and exercise can control their diabetes better than Saudi. This could be due to the poor compliance of Saudis with diet and exercise.[84, 98, 102, 179] Therefore, more Saudis were on either oral medication or insulin than Americans. These findings suggest that more efforts are needed to promote patient compliance with diet, exercise and oral medication.

One of the more important findings to emerge from this case notes review is the large variation among the PHCCs in the type of therapy prescribed for different types of diabetes. For example, the proportion of those patients with T1DM who were on insulin monotherapy ranged from 51.9% at Almowadafeen PHCC to 100% at Johaan PHCC. A similar variation was reported among those patients with T2DM where the proportion of those on insulin monotherapy ranged from 0.9% at Almowadafeen PHCC

to 25.7% at Alnumais PHCC. This variation might be due to the effect of the problem of misclassification of types of diabetes where some PHCC, such as Almowadafeen PHCC, classified all those patients with T2DM who were on insulin plus oral combination as T1DM. This will increase the total denominator of T1DM patients which will reduce the proportion of those patients with T1DM who were on insulin monotherapy. A finding to support this explanation is the lower variation among PHCCs in the proportions of those patients with T2DM who are on oral antidiabetic monotherapy (ranged from 21% to 38%) or oral antidiabetic combination therapy (ranged from 35% to 56%)(Table 19).

These differences may be in part due to the effect of variation between physicians' qualifications, practice and knowledge in different PHCCs. Most of the primary healthcare physicians are from overseas with different experience and training qualifications.

One unanticipated finding was that there was large variation and inequity in the prescribing of aspirin, statins and ACEIs for patients with diabetes. This variability can be attributed mainly to the unavailability of some of these medications, such as statins, ARBs and ACEIs, in some of the PHCCs. These drugs were not available because they were only recently added to the essential drug list of the Ministry of Health (MOH) that are routinely provided to PHCCs. Therefore, they were available mainly in those PHCCs which are official training centres for family medicine residents such as Almanhal and Almansak PHCCs. Besides this, the experience and qualifications of the treating physician may play a role in the variability of prescribing. For example, in the PHCCs which train family medicine residents, the patients were more likely to be

prescribed aspirin and statins than in the other PHCCs. Prescribing of aspirin, statins and ACEIs was also higher in Almowadafeen PHCC clinic, where trainers sometimes give cover.

The regional health affairs should address this inequity in prescribing of aspirin, statins, ARBs and ACEIs by providing them to all the PHCCs. Medications such as glimepiride, glipizide and glitazones which are not currently on the list should also be added to the list and provided to the PHCCs. Taken together, these findings suggest that the MOH essential drug list for PHCCs should be updated to include all of these medications that are necessary to achieve better diabetes care.

### 6.5.3. *Glycemic control*

Glycemic control was poor among a large proportion of patients with diabetes. According to the national standards, fewer than 10% of patients should have a FBG > 180 mg/dl (10 mmol/l) and more than 40% should have a FBG of < 126 mg/dl (7 mmol/l).[200] FBG was recorded in 60% of patients within the previous 12 months and the target of ≤ 126 mg/dl (7 mmol/l) was achieved by only 19.9% of them, while more than 40% had poor glycemic control (> 180 mg/dl (10 mmol/l)). These data concur with previously described national data (chapter 1) which shows consistently that < 50% of patients with diabetes achieved the target glycemic control at the primary healthcare level across different regions of Saudi Arabia.

This suboptimal glycemic control is complex and multidimensional and cannot be attributed to a single factor. However, the analysis showed a relationship between the

levels of glycemic control and other process measures such as the type of diabetes therapy, the number of follow-up visits and the number of health education topics discussed with the patients.

At the PHCCs, as intensity of treatment increases from diet and exercise to insulin plus oral combination therapy, the proportion of patients with poor glycemic control (FBG > 180 mg/dl) rises from 14% among patients on diet and exercise to over 51% among patients on insulin plus oral drug combination. This might indicate that increasing the intensity of diabetes therapy was not successful at controlling blood glucose. This could be due to failure to comply with therapy, diet or physical activity.

The proportion of patients with poor glycemic control dropped from almost 50% among those who did not visit their diabetes clinic during the preceding 6 months to 36.8% among those patients who visited the diabetes clinic 2 times or more during the preceding 6 months. This might indicate that as the number of patient visits rises, the number of patients with poor glycemic control drops. However, the interpretation of this finding should be cautious; compliance of patients with follow-up appointments (visits) might be related to compliance of patients with drugs and diets and could confound this relationship.

Patients who received health education on more topics were less likely to have excellent glycemic control. This rather contradictory result may be explained if the clinicians gave more education to those with poor control than the other patients. It may also indicate that the health education programme is not implemented equally in a systematic manner to all patients. A previous study in Wasat Abha PHCC corroborates this inappropriate implementation by reporting that educated and male

patients with diabetes received education on more topics than illiterate and female patients.[257] The current study has been unable to demonstrate similar findings, but it supports the idea that the delivery of health education might be based on some patient characteristics rather than systematic provision to all patients.

Achieving optimal glycemic control requires cooperation of the persons with diabetes and their healthcare professionals. Patient compliance with diet, exercise, drug therapy and attendance of routine appointments is essential in achieving an optimal glycemic control. Also, the right amount of support and advice from healthcare professionals as well as proper implementation of the processes of diabetes care will help to control blood glucose and prevent health deterioration. Therefore, further research is needed to investigate why glycemic control is poor and what interventions can be used to promote patients' health-related behaviours. In addition, doctor awareness of their role in promoting patients' health-related behaviours need to be increased.

### 6.5.4. *Obesity and overweight*

The local guideline for diabetes management set targets for proportions of patients with normal weight, overweight and obesity to be > 50%, < 30% and < 20% respectively.[214] However, overweight and obesity are common coexisting risk factors amongst patients with diabetes in Abha city and their recommended targets were not achieved (Table 40). This is in contrast to earlier findings of Elhasmi et al who found that the prevalence of obesity in patients with diabetes was lower than the prevalence

of overweight at the national level (29.9% versus 33.3% respectively) and the regional level (23.7% versus 34.2% respectively).[71]

**Table 40: BMI categories proportions by types of diabetes in the PHCCs**

| BMI (kg/m2) | Normal weight 18.5-24.9 | Overweight 25-29.9 | Obesity >30 |
|---|---|---|---|
| **Targets** | **> 50%** | **< 30%** | **< 20%** |
| T1DM (481) | 26.6% | 31.0% | 36.2% |
| T2DM (3219) | 11.5% | 33.4% | 54.5% |
| **Total (3700)** | **13.5%** | **33.1%** | **52.2%** |

It is apparent from the table that the proportion of patients with obesity is higher than the proportion of overweight patients, particularly among T2DM patients. This difference could be explained if the prevalence of obesity among people with diabetes is rising. In this study, it has been also found that higher BMI was associated with higher risk of diabetes complications ($\chi^2$ for trend = 25.4, df=1, P < 0.001). This is worrying because obesity will increase the risk of diabetes complications. Therefore, it is important to tackle effectively the problem of obesity among the whole population and particularly among patients with diabetes. Further research needs to be done to develop interventions that are effective in promoting compliance with diet and physical activity particularly among patients with diabetes.

### 6.5.5. *Diabetes complications*

According to the local guideline, the proportion of patients with diabetes complications should not exceed 5%. However, in Abha city, 32.2% of patients had at least one of the complications of diabetes. Earlier studies reported a complication

prevalence lower than found in this study. In 1997, 10% of patients with diabetes in Wasat Abha PHCC were found to have at least one diabetes complication.[246] In 1999, 13% of the patients with diabetes had at least one reported complication in Alasyah PHCC at Alqassim region.[258] In 2006, a study which included T2DM patients at 3 PHCCs in the Industrial Jubail City reported a higher prevalence for the presence of at least one diabetes complication (45%).[259] In 2004, a hospital based study reported even a higher proportion (60%) of patients with T1DM who have had one or more diabetes complications.[126] It is therefore likely that among patients with diabetes, the prevalence of diabetes complications is increasing over time.

The prevalence proportions of diabetes complications in this study are similar to what have been reported in the previous primary care based studies (Table 41). The studies that were conducted at the level of the primary health care however reported lower prevalence for diabetes complications than hospital based studies. A possible explanation for this is that diabetes complications are usually treated in hospitals. Therefore, hospital based studies are likely to overestimate the prevalence of diabetes complications and report higher prevalence. However, it is also still possible that the primary care based studies might underestimate the prevalence of diabetes complications due to several reasons. First, inadequate availability of laboratory and clinic resources at PHCCs might be one of the causes of ineffective screening for diabetes complications. Second, inappropriate referral and feedback systems between PHCCs and hospitals might result in poor documentation of diabetes complications in the records of patients at PHCCs. Third, more than half (55%) of patients were not referred to the hospital for annual screening for complications in 2011 and finally, even

when they were referred, some clinical screening examinations were not done or documented for the majority of patients e.g. foot examination. These inadequacies of the care processes of identifying complications would lead to poor identification of diabetes complications.

Due to lack of internationally agreed standards for diagnosing and assessing the presence of diabetes complications, it is difficult to make comparisons between different populations.[37] Despite these limitations, comparing of prevalence proportions of diabetes complications among different countries provides some indication of diabetes control and morbidity. It has been reported that some diabetes complications are very common. In the UK for example, by the time the patients with diabetes are diagnosed, 50% of T2DM patients show signs of diabetes complications.[260] At the global level, Amos et al reviewed 119 studies from different countries and showed that there is considerable variation among countries in the prevalence of diabetes complications. However, it was clear that most of the reviewed studies across the world reported retinopathy prevalence of >30% (44/58), nephropathy prevalence of >6% (32/38), neuropathy prevalence of >20% (30/34), coronary heart disease of >10% (38/48), hypertension prevalence of >25% (35/40), peripheral vascular disease of >3% (20/25) and amputation prevalence of >0.5% (13/16).[261]

The Scottish diabetes survey in 2010 estimated that 28.5% of people with diabetes had retinopathy, 4.4% had foot ulcer, 9.1% had myocardial infarction.[213] In the United states, it has been estimated that 67% of adult patients with diabetes had

hypertension and about 60-70% of all patients with diabetes have mild to severe neuropathy.[255]

By comparing these studies with those conducted in Saudi Arabia, it is clear that the prevalence of diabetes complications in this study was lower than would be expected. What is now needed therefore is a cross-national population based study to estimate accurately the prevalence of diabetes complications in Saudi Arabia using standardized criteria for the screening and diagnosis of diabetes complications. This would help to estimate the actual current burden of diabetes in Saudi Arabia and encourage the government to initiate preventive strategies and promote diabetes control.

**Table 41: A summary of the reported prevalence of some diabetes complications in Saudi Arabia**

| **Study settings** | **Primary health care settings** | | | | | **Hospital settings** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Complications % (/N)** | % (/N) | % (/N) | % (/N) | % (/N) | **% (/N)** | % (/N) | % (/N) | % (/N) | % (/N) |
| ***Study author, year, (diabetes type)*** | *Khattab, 1995*[256] | *Alowayyed, 1995*[262] | *Alalfi, 1999*[258] | *Alkhaldi, 2002*[246] | ***Current study*** | *Famuyiwa, 1989*[42] | *Ammari, 2004, (T1DM)*[126]* | Alwakeel, 2004, (T2DM)[263] | Alarfaj, *2006*[264] |
| **Hypertension** | -- | 31 (390) | 35.2 (159) | -- | **23.5 (4279)** | 25.6 (930) | 25 (100) | 78 (1952) | 38.5 (260) |
| **Retinopathy** | 8 (88) | 17.9 (240) | 3.8 (159) | 8.4 (107) | **11.1 (4243)** | 31.5 (584) | 7 (100) | 16.7 (1952) | 16.5 (260) |
| **Nephropathy** | 2 (146) | 13.3 (218) | 1.3 (159) | 1.2 (87) | **1.9 (4253)** | 17.8 (931) | 2 (100) | 32.1 (1952) | 16.5 (260) |
| **Neuropathy** | 2.7 (146) | 4.8 (--) | 1.9 (159) | 2.3 (169) | **0.7 (4247)** | 35.9 (689) | 6 (100) | 13.7 (1952) | 11.5 (260) |
| **Cardiovascular** | 2 (146) | 6.6 (--) | 1.9 (159) | 3.6 (169) | **3 (4271)** | 11.3 (995) | 4 (100) | 37.4 (1952) | 13.5 (260) |
| **Foot diseases** | 1.4 (146) | 0.8 (--) | 2.5 (159) | 1.3 (60) | **0.9 (4240)** | 10.5 (1000) | -- | 6.2 (1952) | -- |
| **PAD**** | -- | -- | -- | -- | **0.4 (4256)** | -- | 1 (100) | -- | 2.7 (260) |

**Ammari's study is a private hospital based study, **PAD: Peripheral arterial disease.*

### 6.5.6. *Referral and feedback system*

The referral and feedback system between PHCCs and hospitals is inefficient. Only 45% of people with diabetes were referred to the hospital for annual checkups in the preceding 12 months and the rate of feedback was 71%. Therefore, the shared care of patients by the primary care team and the specialist hospital team is still inadequate. A study at Wasat Abha PHCC in Abha city assessed the referral system eight years after its implementation.[265] It found that the hospital feedback rate was only 39.2%. The study reported several inadequacies and omitted items in both the PHC referral letters and the hospital feedback reports. Inadequacies included missed information, unclear handwriting and lack of recommendations.[265] At the same PHCC, another study audited the referral of patients with diabetes to the hospital eye clinics.[138] At the end of 1996 and 1997, 40% and 68.5% of patients with diabetes were referred to the ophthalmology clinics respectively. The feedback rates were 72% in 1996 and 71.2% in 1997 which was lower than the national target (100%).[138] The processes of referring patients and receiving hospital feedback need to be reviewed. It is essential to develop clear patient pathways and referral guidelines between the PHCCs and the hospitals. These guidelines should then be implemented in appropriate ways in order to increase both the referral and feedback rates.

### 6.5.7. *Illiteracy and health education*

Illiteracy was common among patients with diabetes particularly among females. Contrary to experience in the western world, the data showed no difference between illiterate and non-illiterate patients in risk of having FBG above the recommended

target (FBG > 130 mg/dl), (OR=0.8, 95% CI: 0.7-1.0, P < 0.123). In fact, illiteracy is not an indicator for the socioeconomic status of patients in Saudi Arabia due to several historical, social and cultural contexts. However, poor educational status of more than 40% of patients with diabetes in Abha city should be considered when planning for health education programmes and interventions. For example, health education by verbal discussions might be better than providing pamphlets and posters for such group of patients. Several studies either in the same region of Abha or from different regions of Saudi Arabia reported similar or higher proportions of illiteracy among patients with diabetes.[85, 246, 258, 266-267]

The current health education programme should be improved not only in its implementation for all individual with diabetes but also its components and its methods of delivery. Health education programme should incorporate knowledge and skills development as well as behavioural interventions. The components of the programme and its method of delivery should be tailored according to the current stage of diabetes, type of treatment, level of education, ability and readiness for change and other individual needs and circumstances. More research is needed to explore what are the effective educational interventions that can be implemented in the Saudi culture and healthcare system.

### 6.5.8. *Variation of the process and outcome measures*

Inadequacies of the process and outcomes measures of diabetes care were found in all the PHCCs. For example, HbA1c was measured in only 4% of patients with diabetes in Abha city, which is exceptionally low in comparison to other countries. HbA1c was

measured for 96% for people with diabetes in the previous 12 months in the Tayside region of Scotland.[20] In England, it was measured for 92% of patients.[268] FBG should have been measured and recorded for 100% of people with diabetes in the preceding 12 months, however, it was measured and recorded for about 60% of patients. The same inadequacies occurred for measuring blood pressure. In addition, the majority of patients did not achieve the recommended targets for glycemic control (77%) or lipid control (81%). The referrals for annual review and screening for diabetes complications were also inadequate, particularly the clinical examination of the cardiovascular system, nervous system, eye and foot.

These inadequacies could be attributed to the complex interaction of all the healthcare elements including professionals, patients, and healthcare system. A similar explanation could apply to the differences in the process and outcome measures between the PHCCs. The variation of the resources available in each PHCC as well as the number of healthcare staff and as a result the workload could produce variation in the process and outcome measures of diabetes care. The availability of family medicine trained physicians in some PHCCs such as Almanhal, Almansak and Almowadafeen PHCC might contribute to this variation. In addition, the socioeconomic status of the population of each PHCC might play a role in this variation. Almansak PHCC for example is located in a new established neighbourhood where its population is expected to be more young and affluent than other parts of the city. This PHCC was one of the best PHCCs in having adequate resources, process and outcome measures. On the other hand, Alaziziah PHCC, which is located in an old and less affluent area, was one of the poorest centres in both the process and outcome measures of diabetes

care. It was also the least equipped centre in the city according to the findings of the scoring system that was presented in the previous chapter.

Because of the lack of data on the socioeconomic status at the individual and neighbourhood levels, it is recommended to have a system and measures for assessing the socioeconomic status. It is important to show the relative levels of social and economic deprivation across the entire city or even the country to assess the actual effect of the socioeconomic status on patients' health and service delivery. Lack of these data is one of the limitations that should be addressed.

### *Diabetes care in the previous Saudi literature*

Previous studies in Saudi Arabia have reported similar inadequacies. A limited number of studies assessed specifically the quality of diabetes care in Saudi Arabia. Most of these studies were limited to one or a few healthcare centres or hospitals. In 1995, an audit of diabetes care in a Almanhal PHCC in Abha city showed that only 19.8% of patients achieved good diabetes control according to the national quality assurance protocol.[256] In 1997, Khattab and his colleagues reported a poor diabetes care at Almanhal PHCC.[269] Alkhaldi and Khan, in another study, assessed the impact of a diabetes mini-clinic on the quality of diabetes care at Wasat Abha PHCC in Abha city. They showed that the initiative of diabetes mini-clinics improved the process and outcomes of diabetes care.[246] However, several other studies in Aseer region reported deficiencies and inadequate availability of some diabetes care resources such as lab facilities, drugs and health education essentials. [257, 270-271] Similar deficiencies and inadequate care process were reported in other regions of Saudi Arabia.[180, 258, 264]

A national study published in 2009, which was a part of an international study, evaluated the current medical care of T2DM in Saudi Arabia.[106] The study collected data on diabetes management and control from 28 PHCCs and included 353 patients with diabetes. Of all patients, 63 to 86% had never been screened for diabetes complications or cardiovascular risk factors during the previous year.[106] Only 31% were screened for retinopathy or nephropathy and 14% had their cholesterol measured. More than two thirds of the patients had not reached the target HbA1c of < 7% and its average was 8.20±1.89%. In addition, only 16% attained the target blood pressure of < 130/80 mmHg and 65% had lipid profile above the recommended target. Only 45% were educated by diabetes educators.[106]

At the hospital level, a study compared the achievement of NICE guidelines for care of T2DM patients at two hospitals in Riyadh, Saudi Arabia (SA) and Grimsby, United Kingdom (UK). The recommended annual screening for blood pressure, albuminuria, lipid profile and HbA1c were more frequently carried out at Diana Princess of Wales Hospital in Grimsby, UK than King Fahad National Guard Hospital in Riyadh, SA (100, 81, 92, 95% versus 95, 51, 84, and 89% respectively).[272] The proportions of patients who achieved the recommended target for total cholesterol (< 5mmol/l), LDL-cholesterol (< 3mmol/l) and HbA1c (≤ 7.5%) were better achieved at Grimsby, UK than Riyadh, SA (71, 75, 35% versus 54, 51 and 18% respectively).[272] However, the recommended targets for systolic and diastolic blood pressure (< 140/<80mm Hg) were achieved at higher percentages in the Saudi hospital than the UK hospital (53 and 55% versus 46 and 39% respectively). [272] In comparison with the neighbouring countries, a systematic review reported that the quality of care of T2DM in all the GCC

countries based on glycemic, blood pressure and lipid control indicators was sub-optimal.[110]

### *Recommendations*

It is important to improve the processes of diabetes care in Saudi Arabia in order to optimally control diabetes and thus reduce its complications and burden. The lab resources and services in all the PHCCs and also in the Abha general hospital should be improved. The HbA1c test is an important measure of the overall blood glucose control. It is not available in the PHCCs and only recently one machine became available in AGH. It should be available and easily accessible to all patients with diabetes.

The Regional Health Affairs should look at how the annual reviews for people with diabetes is organized and implemented and try to ensure that all the required investigations and examinations are carried out and their results are recorded. Introducing electronic records and information systems will help to facilitate auditing and improve diabetes care. The current guidelines for diabetes care need to be improved and its implementation should be assessed and monitored. As a result, the screening for diabetes and its complications will be more effective.

It is not only recommended to increase availability of resources of diabetes care but it is also important to improve and promote the health-related behaviours of both professionals and patients. Thus, we need more research to understand the healthcare-related behaviour of both professionals and patients. For example, the underlying reasons for poor implementation of diabetes guidelines by healthcare

professionals need to be explored. Recording of patient information including health history, examinations conducted and their results needs to be improved. Patient compliance needs to be assessed and recorded in all the PHCCs and more research is required to understand the barriers to compliance among people with diabetes in Saudi Arabia. There is a need also for research to develop culturally sensitive behavioural change interventions for Saudi patients that can be used in order to improve health-related behaviours.

### 6.5.9. *Limitations*

A number of important limitations need to be considered. First, the data were obtained from paper-based case notes. Evaluation of the quality of care through case note review is critically dependent on the quality of recording in the case notes. Validity of the collected data depends on the accuracy and completeness of the patients' records. Poor recording could limit the value of retrospective critical review of care. Further, there might be a relationship between poor case notes and poor quality of care.[273] The quality of recording information in the paper-based case notes of patients with diabetes has not been assessed in published research in Saudi Arabia. Patients who did not have a recorded result for any measure were assumed not to have received that measure. This might imply that the conducted process measures could be underestimated because of missed recording. Nevertheless, case notes are the most obvious source of data for research and assessment of healthcare.[217] Reviewing patient case notes allows collection of data on large numbers of patients and for the full range of diabetes cases including for example newly diagnosed, well-

controlled and severely ill patients. However, it is recommended to undertake research to assess the quality of recording information in the patient case notes and subsequently develop interventions to improve recording if required.

Secondly, some data items were not consistently recorded. For example, patient compliance with diet, exercise, medications and follow-up appointments were not recorded consistently among the PHCCs. Therefore, assessing some patient related behaviours such as compliance was not feasible. It is important to develop standardized sheets and forms for all the PHCCs to allow and facilitate consistent recording.

Thirdly, a specific team of nurses was assigned for each PHCC to review the case notes. The experience and knowledge of each team member might contribute to the variation of some findings between the PHCCs. Further, it has been found that different types of staff undertaking case notes review appeared to interpret the recorded care differently when they each reviewed the same records. [273] However, they all performed reasonably well when using criterion-based review. [273] Therefore, the data collection forms were designed using simple and easy-to-fill questions with specific list of answers, mostly yes or no answers. This might help to reduce this difference in interpreting the recorded measures of care. In addition, to overcome this problem, at least one meeting was conducted with each team to explain and train the teams on how to fill in the questionnaire correctly. Moreover, a mobile phone number of the main researcher (AA) was given to all the teams in case if they need an answer to any question during the working hours.

## 6.6. Conclusion

Reviewing the case notes of people with diabetes provided insight into the current status of diabetes, its management, complications and the quality of diabetes care in Abha city. It is not just that some PHCCs failed to achieve the targets; actually none of the PHCCs have achieved the targets. The health status of people with diabetes was not satisfactory. Diabetes management was found to be suboptimal. Process and outcome measures of diabetes care were variable among PHCCs, did not meet their recommended targets and need to be improved. Fewer than 50% of patients meet targets for glycemic and lipid control indicators. The prevalence of diabetes complications was lower than expected. A cross-national population based study to estimate accurately the prevalence of diabetes complications in Saudi Arabia is needed.

Poorly controlled diabetes is a challenge. Doctors try to control diabetes by moving patients to higher doses of medications, initiating insulin therapy when required and delivering more health education. It is important to Increase diabetes care resources and services to improve diabetes care; however, promoting patients' health-related behaviours should be targeted as a matter of urgency.

# CHAPTER SEVEN

# Stakeholder views

*This chapter explores the view and perceptions of key informants including patients, physicians, nurses, managers and pharmacists regarding their experience with the current diabetes care and their priority needs. Conclusions are drawn regarding identified needs and areas for service improvement.*

# Chapter 7: Stakeholder views

## 7.1. Introduction

Patients often have insights and expertise to share in health services research. Including patients in health services research could improve the quality and impact of research.[274] Therefore, the knowledge, preferences and experience of patients should be respected, valued and drawn upon to influence and shape the organization of healthcare.

In developed countries such as the United Kingdom, the involvement of patients and the public in the planning and development of the healthcare services is an explicit policy.[275-277] Involving patients in making decisions about their healthcare is considered now as an essential part of evidence based healthcare.[278]

In order to inform diabetes service provision, the views of different interested parties particularly patients with diabetes, should be considered. Patients' perspectives often complement those of healthcare professionals and researchers. [274] The views and input of patients may influence the identification of healthcare needs and problems as well as the interpretation, dissemination, and implementation of research findings. [274]

In healthcare services research, particularly in health needs assessment research, the views of interested parties should be assessed in a systematic way.[279] The needs assessment approach used to assess the views of interested parties and canvass their

demands and wishes called corporate approach.[199, 228] The commentators emphasise the importance of "the systematic collection of the knowledge and views of informants on healthcare services and needs".[228] Being responsive to local informants' views is likely to result in healthcare services which are better suited to local needs and therefore more appropriate.[279-280]

## 7.2. Objectives

The objectives of this chapter were first to explore the views and perceptions of patients and key health professionals to determine:

- What are the unmet healthcare needs of people with diabetes?
- What are the unavailable diabetes services?
- What are the current problems in delivering diabetes care?

In addition, it sought to gain an understanding of patient/carer experience in using the diabetes services and to seek views on how services could improve and what are the barriers to service improvement.

## 7.3. Methods

### 7.3.1. *Methods of constructing the interview schedules*

To ensure a diversity of ideas, experience, knowledge and perspectives, four different key informants were interviewed including, people with diabetes, healthcare professionals (physicians and nurses), healthcare managers and pharmacists. Four semi-structured interview schedules were prepared to interview each group of key informants (Appendix 12-15). The interview schedules included both unstructured and structured questions. The unstructured format included open-ended questions such as "what are the health needs that have not been currently met?" The structured format included specific questions of fact or opinions that can be answered with numerating a simple list of items, or by choosing from a multiple choice set, or by responding to ratings on a rank scale. All questions in each interview schedule were designed to fit the role and responsibility of each interviewee. Based on the purpose and objectives of this chapter, a set of themes were investigated. These themes included perception of:

1. Unmet health needs
2. Healthcare problems
3. Diabetes services that are unavailable
4. Service improvement needed
5. Barriers to improving services

Participants were also asked to prioritize health needs and problems by ranking them from 1 to 5, where 1 was the highest priority. The participants were asked to consider a number of prioritization criteria which included size of the need; its urgency; severity and seriousness; impact; and availability of solutions.

Under each theme, several carefully worded questions were developed to explore the local views on priority and current concerns. In addition, interviewees were asked to give demographic information such as age, sex, occupation, level of education, and type of accommodation. The interview schedule to patients also enquired about some patient characteristics such as type of diabetes, current medications used and if patient had any complications.

The healthcare professionals and managers were asked to rate the perceived importance of preventing diabetes, early diagnosis of diabetes by screening and preventing diabetes complications. A five point scale, 1 being not important and 5 being very important, was used to collect responses.

The pharmacists were asked specifically about the drug supply problems that might affect people with diabetes, the perceived priority of these problems and the solutions suggested. Moreover, they were asked about the availability of drugs related to diabetes (Appendix 15).

### 7.3.2. *Selecting and training the interviewers*

The main researcher (AA) interviewed healthcare professionals, managers and pharmacists and some patients with diabetes. An invitation letter to join the research team was given to all the physicians who work in the PHCCs (Appendix 16). The invitation letter explained the goals and reasons for doing the research, the benefits and nature of participation and how to join the team. An online web-based membership form was designed by (AA) to facilitate responding.[281] Fourteen

physicians joined the research teams to interview people with diabetes. Due to some cultural beliefs which are deeply embedded in the Saudi communities, it was expected that most of Saudi women would prefer to be interviewed by female doctors. Therefore, the aim was to recruit the same number of male and female interviewers. However, only three female physicians agreed to join the research team as interviewers. The main researcher (AA) organized a half-day meeting with all interviewers to be trained on how to conduct a face-to-face interview using the novel semi-structured interview schedules. Those physicians who were not able to attend the meeting were trained in interview methods by the main researcher (AA) at their clinics. The mobile phone number of the main researcher was given to all the interviewers so that he could answer any questions that might arise. The members of the supervision teams visited each PHCC on a weekly basis to provide additional training and answer any questions.

### 7.3.3. *Piloting*

At the half-day meeting, the interviewers reviewed and tested the semi-structured interview schedules. Some questions were deleted and some were amended in response to the suggested comments of the participating physicians. Then the semi-structured interviews schedules were tested again by the main researcher (AA) at Almanhal PHCC by interviewing 3 patients, 2 healthcare professionals, one manager and one pharmacist. As a result, additional re-wording and amendments were made.

### 7.3.4. *Methods of sampling and interviewing*

Due to the limited number of healthcare professionals, managers and pharmacists in Abha city, purposive sampling was used to identify those who were involved either directly or indirectly in providing healthcare services to people with diabetes. These groups of key informants were interviewed face-to-face by the main researcher (AA).

The physicians, who joined the research team as interviewers, were responsible for interviewing a systematic sample of patients with diabetes who attended their clinics during the study period which lasted for 2 months. Because of the limited number of physicians who work in each PHCC, it was difficult to arrange free hours or days for physicians to work solely on interviewing patients. This would disturb and interrupt their working duties and have negative effects on the service delivery. Further, due to variation among PHCCs in the number of interviewers, workload and patient overcrowding, each PHCC selected the "every $N^{th}$ patient" to be interviewed from the visiting patients. This technique of sampling was used to reduce the negative effects of conducting interviews during the working hours. The target number to interview in each PHCC was at least 10% of the total number of registered patients with diabetes. The interviews with patients were face-to-face interviews. The interviewers were asked to stick with the sampling procedure and ignore their personal opinion or knowledge of patients' past history when recruiting participants. Children under 15 years old or people with learning and communication difficulties were excluded. The interviewers did not collect any data on the number of patients who refused to participate or the reasons for their inability to participate.

Interview recording is culturally unfamiliar in Saudi Arabia and could make participants more reluctant to freely express their views. Therefore, note taking was used to summarise the answers of the interviewees. The notes were written during the interviews. The duration of each interview was between 20 to 40 minutes. The interviewer was allowed to re-word, re-order or clarify the questions to further investigate topics introduced by the participant. After each question or at the end of the interview, the interviewers read the written notes on the participants to receive any comments or corrections.

### 7.3.5. *Ethical consideration*

The study was approved by the research ethics committee of the University of Dundee and that of the Ministry of Health (MOH) in Saudi Arabia where the interviews were conducted. Interviewees were given written information about the study which explained clearly the objectives and reasons of seeking their views and doing the research (Appendix 17). Informed consent was obtained from all participants (Appendix 18). For children between 15 and 18, informed consent was obtained from both the child and the accompanying parents.

### 7.3.6. *Methods of analysis*

In this exploratory analysis, the aim was to gather lists of major categories or themes on key informants' perceptions of health needs, healthcare needs and problems, needs for healthcare services and barriers to improvements of diabetes care. All data were entered and analysed using the Statistical Package for the Social Sciences (SPSS)

statistical software, version 20. Most of the interview questions asked for a list of items for perceived needs, problems, services or barriers to improvement. Descriptive coding was used first to describe and code each specific response (note) by one coder (AA). Then under each question, related inductive codes were grouped into different themes which in turn aggregated into categories by three coders (AA, IC, LI). With this analytic coding, several themes were derived from the data analysis. The perceived needs and problems were similar and therefore, the same codes, themes and categories were applied to needs and problems. The lists of codes and the derived themes and categories for all the responses to the questions about needs, problems, services and barriers for all key informants interviewed are shown in appendix 19.

Counting the frequency based on the number of individual participants who mentioned a particular response (code) rather than the total number of times a response appeared in the text was used. This approach helps to identify which themes and responses were common and which rarely perceived.

## 7.4. Results

### *7.4.1. Patient views*

***Demographics:***

In total, 235 people with diabetes were interviewed. The participant physicians interviewed 211 patients across all the PHCCs in Abha while the main researcher (AA) interviewed 24 patients, including 6 patients in the PHCCs and 18 patients in the ADC. More male patients 70.6% (166) were interviewed than female. Although the majority (132) were middle aged (45-64 years), 4.3% (10) were youths aged between 15 to 24 years and 10.6% were adults (25-44 years old). More than one third of patients 39.6% (93) were retired; 26.4% (62) were employed while 28.5% (67) were unemployed. More than one fifth (52) of patients were illiterate; one third (79) can read and write. Of educated patients, 14% (33) had a bachelor degree and only 3 patients had a postgraduate degree.

Approximately 13% (30) were smokers, 5% (11) were ex-smokers, 78% (183) were non-smokers and the smoking status of the remainder was unknown. The majority of patients (85%) had T2DM. Almost two thirds of the patients (65.5%) were on oral antidiabetic drugs and one third (32.3%) on insulin or insulin plus oral antidiabetic drugs.

Most of the patients 70% (165) reported that they have not had any diabetes complications. Among patients who reported having complications, 24 had ischemic heart disease, 6 had cerebrovascular disease, 7 had peripheral arterial disease, 31 had retinopathy, 11 had nephropathy, 21 had neuropathy and 16 had foot problems.

Thirteen patients (5.5%) reported that they live alone and half (121) of the patients (51.5%) recalled having glucometer at home.

The majority (57.4%) of patients recalled that their diabetes was diagnosed because of diabetes symptoms while 29.4% were diagnosed by chance. Only 5.5% reported that their diabetes was diagnosed because of the screening programmes. Most of the patients (93%) reported that at the time of diagnosis, they did not have any complications.

***Perceived health needs and problems:***

Overall, most of the issues raised were identified both as needs and problems. Common themes that emerged from interviews with patients were (Table 42): laboratory services and resources are not always available; insufficient availability of antidiabetic drugs; insufficient availability of insulin syringes and alcohol swabs; unavailability of supportive tools such as glucometer with its strips and needles; insufficient number of healthcare staff particularly trained and specialist professionals including diabetologists, ophthalmologists and dieticians; inappropriate appointment system and crowding particularly in hospitals; inappropriate annual referral system to hospitals; staff attitude problems such as carelessness and lack of good communication with patients; inadequate health education; and home care.

A quarter (25.5%) of patients felt that more laboratory resources and tests are needed. The same theme was reported by 23% of patients as a problem encountered in the PHCCs; however, only 7% perceived that as a problem in hospitals. Insufficient

availability of antidiabetic drugs was perceived as a problem in the PHCCs more than in hospitals. On the other hand, insufficient numbers of healthcare staff and inappropriate appointment and referral systems were perceived mainly as problems in hospitals (Table 42).

Patients were asked to suggest solutions that met the identified needs or solved the identified problems. The overall response to this question was poor. The patients' responses were simply to remedy the deficiencies. Further, when the patients were asked what the differences their suggested solutions would make, the most frequent answers were that health would improve and patient's satisfaction would be better. Therefore, because the responses were not informative, the data were not presented.

**Table 42: Issues of concern raised by people with diabetes in Abha city.**

| Theme | Issue of concern | Needs N=235 | Problems N=235 | |
|---|---|---|---|---|
| | | | PHCCs | Hospitals |
| Laboratory resources | Availability of laboratory investigations | 60 | 54 | 17 |
| | Availability of ECG test | 8 | 3 | 0 |
| | Availability of X-ray machine | 6 | 6 | 0 |
| Pharmacy resources | Insufficient availability of drugs | 52 | 56 | 12 |
| | New anti-diabetes drugs | 7 | 2 | 0 |
| | Availability of Insulin (Lantus, Mixtard) | 5 | 1 | 0 |
| | Statins | 16 | 1 | 1 |
| | Glucometer, its strips & needles | 54 | 8 | 3 |
| | Insulin syringes | 6 | 1 | 2 |
| | Alcohol swabs | 12 | 1 | 1 |
| Manpower | Sufficient working staff | 11 | 12 | 27 |
| | Sufficient trained staff | 8 | 10 | 6 |
| | Dietician clinic (dietician) | 9 | 3 | 4 |
| | Ophthalmology clinic (ophthalmologist) | 8 | 3 | 2 |
| | Diabetologist clinic (diabetologist) | 11 | 11 | 6 |
| | Specialist trained physicians | 10 | 6 | 4 |
| Clinic system | Keeping clinicians work in their clinics all the time (not to change them frequently ) | 2 | 8 | 1 |
| | System for organizing the clinic and patients entrance to the clinic | 0 | 3 | 9 |
| | Health insurance system/ financial support | 6 | 0 | 1 |
| Appointment system | Inappropriate appointment system & times | 4 | 11 | 26 |
| | Long appointment waiting list | 1 | 0 | 31 |
| | Patient overcrowding | 4 | 10 | 90 |
| | Long waiting time (while fasting) | 0 | 2 | 21 |
| | Long appointment time with ophthalmology clinics | 0 | 0 | 12 |
| Referral system | Inappropriate annual referral system to hospitals (difficulties) | 6 | 1 | 10 |
| Staff attitude | Careless healthcare staff | 1 | 5 | 8 |
| | Lack of good communication with patients | 1 | 7 | 8 |
| Education | Lack of health education materials, systems, programs and clinics | 9 | 6 | 4 |
| Home care | Home care | 12 | 3 | 1 |

***Patient perception of important diabetes services that are not available or need to be improved:***

The same themes that emerged from the answers to the questions about unmet needs and problems were also identified here (Table 43). However, some differences were noted. Laboratory services were the most commonly reported unavailable services or services that need to be improved. Some specific unavailable laboratory services in PHCCs were identified such as ECG test, lipid profile tests, HbA1c test, renal function tests (RFT), liver function tests (LFT) and x-ray machine. Regarding insufficient availability of healthcare staff, some patients perceived podiatry services as unavailable services and some as services that need to be improved in the primary healthcare.

In the appointment system theme, while long appointment waiting list was perceived as a problem, the need for an electronic appointment system and recalling system was considered as an important unavailable service that might resolve the long waiting problem. Moreover, opening new diabetes clinics which would be open every day was perceived as a way of improving diabetes services.

Although few patients perceived health education as a need or its lack as a problem, 32 patients (13.6%) perceived it as an important unavailable service. Diet and weight reduction programmes were also reported as unavailable services.

**Table 43: Important, unavailable services and areas for improvement in primary healthcare raised by people with diabetes.**

| Theme | Issue of concern | Unavailable services N=235 | Services need to be improved N=235 |
|---|---|---|---|
| Laboratory resources | Some laboratory services in PHCC (a laboratory with all investigations) | 91 | 87 |
| | ECG machine/ ECG test | 18 | 3 |
| | Lipid profile tests | 10 | 0 |
| | HbA1c test | 8 | 0 |
| | X-ray machine | 7 | 2 |
| | RFT and LFT | 4 | 0 |
| Pharmacy resources | Some drugs (all drugs to be available) | 62 | 62 |
| | Glucometer, its strips & needles | 20 | 6 |
| | Availability of Insulin (Lantus, Mixtard) | 16 | 0 |
| | Statins | 6 | 2 |
| | Insulin syringes | 5 | 0 |
| | Alcohol swabs | 4 | 0 |
| Manpower | Diabetologist clinic (diabetologist) | 21 | 6 |
| | Dietician clinic (dietician) | 19 | 21 |
| | Specialist trained physicians | 18 | 12 |
| | Ophthalmology clinic (ophthalmologist) | 17 | 5 |
| | Podiatrist clinic | 4 | 10 |
| | Sufficient working staff | 3 | 14 |
| Appointment system | Appointment and follow up system | 34 | 21 |
| | Electronic appointment system | 5 | 0 |
| | Appointment reminder by calling or SMS | 4 | 0 |
| | System for defaulter follow up | 3 | 1 |
| | More clinics for diabetes, to open mini-clinics many times per week | 3 | 22 |
| Education and promotion | Health education/ educator, materials/ place/ screens/programs/lectures | 32 | 7 |
| | Program for weight reduction and diet | 4 | 0 |
| Home care | Home care | 10 | 3 |

***Perceived barriers to service improvement:***

Common themes that emerged from interviews with patients regarding barriers to service improvement are shown in table 44. The most common barrier mentioned by patients (22.5%) was insufficient staff availability. Inadequate services such as laboratory services and pharmacy services were the second most common perceived barrier. The patients perceived that primary healthcare is ignored by higher authorities in MOH and its administration is poor. These were reported as barriers to improving services. In addition, lack of health education and appropriate appointment systems were perceived as barriers to service improvement by 5% of patients.

**Table 44: Patient views on barriers to improvement of healthcare services**

| Theme | Top barriers to improvement | Frequency N=235 |
|---|---|---|
| **Organizational barriers** | PHCCs are ignored by higher authorities of MOH and managers/ Weak commitment of higher authorities/ Higher authorities do not respond to the PHCCs requests/ Lack of attention to PHCCs by higher authorities | 16 |
| | Patient overcrowding | 16 |
| | Lack of financial support for healthcare services | 8 |
| **Administrative barriers** | Careless administrators and managers/ administrative problems/ Lack of primary health care administration and communication system/ Poor management | 11 |
| **Staff availability** | Lack of diabetologists (clinics) | 14 |
| | Insufficient staff/ Shortage of trained healthcare staff (specialists)/ Difficulties of employing more staff | 53 |
| **Staff training and performance** | Lack of good communication with patients | 7 |
| **Unavailable services** | Lack of good health education/ lectures, campaigns | 13 |
| | Lack of appointment system & reminder | 12 |
| | Lack of diabetes centres | 8 |
| **Inadequate services** | Inadequate lab investigations and devices/ resources/ Insufficient lab services (lab support) | 33 |
| | Incomplete pharmacy resources/ lack of some drugs | 28 |
| | Limited resources in PHCCs / Shortage of supportive services/ Lack of enough resources | 21 |

### 7.4.2. Healthcare professional views

***Demographics:***

A total of 29 healthcare professionals were interviewed; in more detail, 21 were males, 17 were Saudi professionals, 22 were from the 10 PHCCs and 7 were from both ADC and AGH, 19 were physicians and 10 were nurses. Twenty three have received training on management of diabetes; however, 28 perceived that they need more training on diabetes management.

***Perceived health needs and problems:***

Compared to patients, similar themes emerged from the responses of healthcare professionals (Table 45). However, while patients made complaints about staff attitude and behaviours, the health professionals also made complaints about patient compliance and knowledge. Half of the healthcare professionals (14) perceived that poor patient compliance is a problem in PHCCs. Lack of health education resources, insufficient availability of drugs and provision of glucometers for patients were the most frequent perceived needs. The professionals also felt that there is a need for more laboratory resources and tests to be available, particularly the HbA1c test.

The professionals suggested a variety of solutions to meet the identified needs or to solve the identified problems. The themes that emerged from the suggested solutions were to: increase the number of staff employed, provide health education and health promotion programmes, provide more training opportunities, improve the current system of care by establishing electronic systems, increase number of diabetes clinics and centres, improve the administration systems, open a central laboratory for each

healthcare sector, update the essential drug list, assess needs by consulting experts and patients and finally to improve the communication system between different healthcare level.

Further, healthcare professionals were asked what the differences their suggested solutions would make. The most frequent answers were that the patients' health, satisfaction, compliance with appointments and drugs and control of diabetes would improve. In addition, the professionals indicated that the quality, availability and efficiency of healthcare services would improve and diabetes complications would be lower.

**Table 45: Issues of concern raised by healthcare professionals in Abha city.**

| Theme | Issue of concern | Needs N=29 | Problems N=29 | |
|---|---|---|---|---|
| | | | PHCCs | Hospitals |
| Laboratory resources | Availability of laboratory investigations | 6 | 7 | 1 |
| | Availability of HbA1c test | 5 | 0 | 1 |
| Pharmacy resources | Insufficient availability of drugs | 10 | 7 | 3 |
| | ARBs drug | 2 | 0 | 0 |
| | Availability of Insulin (Lantus, Mixtard, Apidra) | 7 | 0 | 0 |
| | Statins | 2 | 1 | 0 |
| | Glucometer, its strips & needles | 9 | 0 | 1 |
| | A pharmacy in the ADC | 0 | 0 | 2 |
| Manpower | Sufficient working staff | 4 | 2 | 4 |
| | Sufficient trained staff | 1 | 0 | 0 |
| | Dietician clinic (dietician) | 3 | 2 | 2 |
| | Ophthalmology clinic (ophthalmologist) | 1 | 0 | 0 |
| | Diabetologist clinic (diabetologist) | 2 | 0 | 0 |
| | Specialist trained physicians | 0 | 3 | 0 |
| | Health educator | 2 | 1 | 1 |
| | Social worker | 2 | 0 | 0 |
| | Podiatrist clinic (podiatrist) | 1 | 0 | 2 |
| Other resources | Diabetes centres (more than one) | 4 | 0 | 0 |
| | Underdeveloped PHCCs/ Modern & good PHCCs/ PHCCs with insufficient resources | 2 | 4 | 0 |
| | Lack of electronic & computer system | 0 | 3 | 0 |
| | Keeping clinicians work in their clinics all the time (not to change them frequently ) | 0 | 3 | 0 |
| Appointment system | Inappropriate appointment system & times | 1 | 2 | 0 |
| | Long appointment waiting list | 3 | 2 | 2 |
| | Patient overcrowding | 1 | 2 | 4 |
| | System for defaulter follow up | 2 | 0 | 0 |
| | High defaulter rate | 0 | 2 | 0 |
| Referral system | Inappropriate annual referral system to hospitals (difficulties) | 2 | 3 | 0 |
| | Lack of proper communication/coordination between healthcare levels | 0 | 2 | 0 |
| Education | Lack of health education materials, systems, programs and clinics | 11 | 6 | 1 |
| Health promotion | Effective diet & nutrition programs | 1 | 0 | 0 |
| | Reducing weight programs | 2 | 0 | 0 |
| | Lifestyle management programs | 1 | 0 | 0 |
| Patient knowledge & attitude | Weak/Lack of health awareness | 0 | 3 | 0 |
| | Poor compliance | 0 | 14 | 1 |
| Home care | Home care | 5 | 0 | 0 |

***Perception of important diabetes services that are not available or need to be improved:***

Table 46 presents the themes that emerged from the responses of healthcare professionals. Laboratory services, drugs, and health education resources were the common perceived services that are sometimes unavailable and need to be improved. HbA1c test was identified as unavailable laboratory services by 6 professionals. Dietetic services and podiatry services were perceived as unavailable services by 7 and 4 professionals respectively.

**Table 46: Important, unavailable services and areas for improvement in primary healthcare raised by healthcare professionals.**

| Theme | Issue of concern | Unavailable services N=29 | Services need to be improved N=29 |
|---|---|---|---|
| Laboratory resources | Some laboratory services in PHCC (a lab with all investigations) | 8 | 15 |
| | ECG machine/ ECG test | 3 | 0 |
| | HbA1c test | 6 | 0 |
| | RFT and LFT | 1 | 0 |
| Pharmacy resources | Some drugs (all drugs to be available) | 8 | 8 |
| Other resources | Opening more than 1 diabetes centre | 3 | 0 |
| Manpower | Dietician clinic (dietician) | 7 | 3 |
| | Specialist trained physicians | 1 | 1 |
| | Ophthalmology clinic (ophthalmologist) | 1 | 1 |
| | Podiatrist clinic | 4 | 2 |
| | Sufficient working staff | 0 | 3 |
| Appointment system | Appointment and follow up system | 1 | 2 |
| | More clinics for diabetes, to open mini-clinics many times per week | 0 | 3 |
| Education and promotion | Health education/ educator, materials/ place/ screens/programs/lectures | 7 | 9 |
| Referral system | Effective referral system | 1 | 1 |
| Health records | Health records/ electronic | 0 | 3 |
| Home care | Home care | 0 | 1 |

***Perceived barriers to service improvement:***

As shown in table 47, the perceived barriers to improvement were mainly organizational and administrative. Some professionals felt that low patient knowledge and awareness is a barrier to service improvement. Six healthcare professionals perceived that weak commitment of higher authorities of MOH towards PHCCs needs is an important barrier in addition to lack of financial support for healthcare services.

**Table 47: Healthcare professionals' views on barriers to improvement of healthcare services**

| Theme | Top barriers to improvement | Frequency N=29 |
|---|---|---|
| **Organizational barriers** | PHCCs are ignored by higher authorities of MOH and managers/ Weak commitment of higher authorities/ Higher authorities do not respond to the PHCCs requests/ Lack of attention to PHCCs by higher authorities | 6 |
| | Lack of financial support for healthcare services | 5 |
| | Lack of efficient system | 4 |
| | Routine work | 3 |
| | Lack of cooperation, communication between healthcare levels | 2 |
| | Lack of financial incentives | 2 |
| | Patient overcrowding | 1 |
| **Administrative barriers** | Careless administrators and managers/ administrative problems/ Lack of primary health care administration and communication system/ Poor management | 4 |
| | Bureaucracy | 2 |
| | Old managers in charge who are unwilling to improve or change the current system | 2 |
| **Staff availability** | Insufficient staff/ Shortage of trained healthcare staff (specialists)/ Difficulties of employing more staff | 3 |
| **Staff training and performance** | Low staff awareness of what patients need | 2 |
| | Lack of training & specialization | 1 |
| **Patient knowledge and awareness** | Patient's awareness / Low patient's health awareness | 2 |
| **Inadequate services** | Inadequate lab investigations and devices/ resources/ Insufficient lab services (lab support) | 1 |
| | Limited resources in PHCCs / Shortage of supportive services/ Lack of enough resources | 1 |

***Groups in needs:***

Healthcare professionals identified several groups of the population whose health needs are not being currently met. These groups included older people, school age children, expatriates, patients with T1DM and disabled patients.

***Perception of importance of prevention:***

The majority of healthcare professionals rated preventing diabetes, early diagnosis by screening and preventing its complications as very important, (27, 26 and 27 respectively).

***Perception of the barriers to the use of preventive services by high risk population:***

Lack of patient health knowledge and awareness, incorrect patient beliefs, low health education and apprehensions about having diabetes were the common barriers perceived by healthcare professionals (11, 4, 4 and 5 respectively). A small number of healthcare professionals (2-3) perceived that difficult access to services, lack of transport facilities and lack of motivation to participate are also barriers for high risk populations in utilizing the available preventive services.

***Healthcare professionals' views on facilitators and barriers to the implementation of the referral system:***

The five most frequent reported facilitators to the implementation of the referral system were: establishing an electronic referral system, proper cooperation and coordination between PHCCs and hospitals, involving patients in the referral process by taking back and forth the referral and feedback sheets, when the hospital and the PHCC are near to the patient and involving trained healthcare professionals in the referral process.

The five most frequent reported barriers to the implementation of the referral system were: patient overcrowding in hospitals, long waiting time to enter the clinic, unclear referral system, incomplete or missing feedback and lack of cooperation and coordination between PHCCs and hospitals.

***Perception of service evaluation and clinic audit:***

Fifteen out of 29 healthcare professionals perceived that the current healthcare services they provide are evaluated and audited in a continuous manner. However, when they were asked how the services are audited, they reported different audit methods. For example, in ADC, a meeting every week for the staff to discuss any problems was perceived as an audit system. In the PHCCs, reviewing monthly and annually the routinely collected data was perceived as an audit system. Some professionals reported that auditing services is the responsibility of higher authorities not the clinical staff. Those who indicated that the healthcare services they provide are not evaluated or audited indicated that the healthcare services should be audited.

### 7.4.3. Healthcare manager views

***Demographics:***

A total of 13 healthcare managers were interviewed; in more detail, all were males, 11 were Saudi managers, 8 were from the PHCCs, 2 were from both ADC and AGH and 3 were from the Regional Health Affairs (RHA), 4 were executive physicians, 4 were executive nurses and 5 were health administrators. Six have received training on the management of diabetes; however, all perceived that they need more training on diabetes management.

***Perceived health needs and problems:***

Similar themes and concerns were raised from the responses of healthcare managers (Table 48). However, some differences were identified. The managers showed more concerns regarding patient knowledge and behaviours and provided more informative responses. They also indicated that health education and promotion programmes are important needs for people with diabetes. Moreover, the managers reported some administrative needs such as the need for the higher authorities to pay more attention to PHCCs. Managers suggested that they should also address lack of motivation and provide incentives for the primary healthcare staff.

The managers suggested a variety of solutions to meet the identified needs or to solve the identified problems. These solutions were similar to what have been suggested by the healthcare professionals. However, some administrative solutions were suggested such as to improve the policy of providing drugs to PHCCs, build new PHCC buildings and increase the commitment of the higher authorities.

Further, healthcare managers were asked what the differences their suggested solutions will make. The overall responses to this question were similar to what have been reported by the healthcare professionals.

**Table 48: Issues of concern raised by healthcare managers in Abha city.**

| Theme | Issue of concern | Needs N=13 | Problems N=13 | |
|---|---|---|---|---|
| | | | PHCCs | Hospitals |
| Laboratory resources | Availability of laboratory investigations | 3 | 4 | 0 |
| | Availability of HbA1c test | 1 | 1 | 0 |
| Pharmacy resources | Insufficient availability of drugs | 3 | 4 | 2 |
| | Insulin pens | 2 | 0 | 0 |
| | Glucometer, its strips & needles | 5 | 1 | 0 |
| | Insulin syringes | 1 | 0 | 0 |
| | Alcohol swabs | 1 | 0 | 0 |
| Manpower | Sufficient working staff | 4 | 1 | 1 |
| | Sufficient trained staff | 0 | 2 | 1 |
| | Podiatrist clinic (podiatrist) | 1 | 0 | 0 |
| | Diabetologist clinic (diabetologist) | 1 | 0 | 0 |
| | Specialist trained physicians | 2 | 0 | 0 |
| | Biomechanics | 1 | 0 | 0 |
| | Laboratory technician | 0 | 2 | 0 |
| Other resources | Dressing materials | 1 | 0 | 0 |
| | 10g monofilaments | 1 | 0 | 0 |
| | Lack of electronic & computer system | 1 | 0 | 1 |
| | Underdeveloped PHCCs/ Modern and good PHCCs/ PHCCs with insufficient resources | 0 | 3 | 3 |
| | Training courses for all HCPs/ lack of | 0 | 2 | 2 |
| Clinic system | Opening diabetes clinic many days/ all days per week | 1 | 0 | 0 |
| | More care , attention, concern from higher authorities | 0 | 2 | 0 |
| Appointment system | Appointment system for follow-up | 2 | 0 | 0 |
| | Inappropriate appointment system & times | 1 | 0 | 1 |
| | Crowding | 0 | 1 | 1 |
| Referral system | Inappropriate annual referral system to hospitals | 0 | 1 | 1 |
| | Lack of proper communication/coordination between healthcare levels | 0 | 0 | 2 |
| Staff attitude | Lack of good communication with patients | 1 | 0 | 0 |
| | Lack of motivation/ incentives | 0 | 2 | 0 |
| Education | Lack of health education materials, systems, programs and clinics | 4 | 1 | 0 |
| Health promotion | Effective diet & nutrition programs | 2 | 0 | 0 |
| | Exercise programmes | 2 | 0 | 0 |
| | Reducing weight programs | 2 | 0 | 0 |
| Patient knowledge & attitude | Weak/Lack of health awareness | 0 | 2 | 0 |
| | Poor compliance | 0 | 2 | 2 |
| | Don't like to wait | 0 | 1 | 0 |
| | Refusing to be annually referred to hospitals | 0 | 1 | 0 |
| | Requesting drugs without prescription and without visiting the clinic | 0 | 1 | 0 |
| | Poor patient communications/ behaviour inside PHCCs | 0 | 2 | 0 |
| Home care | Home care | 2 | 0 | 0 |

***Perception of important diabetes services that are not available or need to be improved:***

Table 49 shows the themes that emerged from the responses of healthcare managers to the questions about important diabetes services that are not available or need to be improved. The responses were similar to what healthcare professionals indicated. However, a small number of those managers who were interviewed indicated different perceptions such as the need for new governmental buildings for the PHCCs and perception of unavailable screening services for diabetes in Abha.

**Table 49: Important, unavailable services and areas for improvement in primary healthcare raised by healthcare managers.**

| Theme | Issue of concern | Unavailable services N=13 | Services need to be improved N=13 |
|---|---|---|---|
| Laboratory resources | Some laboratory services in PHCC (a lab with all investigations) | 5 | 4 |
| | HbA1c test | 1 | 0 |
| Pharmacy resources | Some drugs (all drugs to be available) | 2 | 1 |
| | Glucometers for patients/ with it strips & needles | 1 | 0 |
| Other resources | PHCC buildings | 1 | 1 |
| Manpower | Dietician clinic (dietician) | 2 | 1 |
| | Ophthalmology clinic (ophthalmologist) | 1 | 1 |
| | Podiatrist clinic | 0 | 1 |
| | Sufficient working staff | 1 | 1 |
| Appointment system | Appointment and follow up system | 0 | 4 |
| | More clinics for diabetes, to open mini-clinics many times per week | 0 | 2 |
| Referral system | Annual referral and examination | 0 | 1 |
| All services | All services need to be improved | 0 | 3 |
| Education and promotion | Health education/ educator, materials/ place/ screens/programs/lectures | 5 | 2 |
| Clinic system | Early diagnosis and screening services | 1 | 1 |
| Home care | Home care | 2 | 0 |

***Perceived barriers to service improvement:***

The managers who were interviewed suggested several barriers which were similar to the suggestions of healthcare professionals (Table 50). However, some different organizational barriers and inadequate services were reported. Three managers indicated that there are problems with the administration system which were perceived as barriers to service improvement. One manager stated that lack of team work is an important barrier to service improvement and another indicated that the rented houses for most of the PHCCs in Abha is an important barrier.

**Table 50: Healthcare managers' views on barriers to improvement of healthcare services**

| Theme | Top barriers to improvement | Frequency N=13 |
|---|---|---|
| **Organizational barriers** | PHCCs are ignored by higher authorities of MOH and managers/ Weak commitment of higher authorities/ Higher authorities do not respond to the PHCCs requests/ Lack of attention to PHCCs by higher authorities | 2 |
| | Lack of financial support for healthcare services | 3 |
| | Lack of efficient system | 2 |
| | Lack of cooperation, communication between healthcare levels | 1 |
| | Weak governmental inter-sectoral coordination | 1 |
| | Lack of leadership | 1 |
| **Administrative barriers** | Careless administrators and managers/ administrative problems/ Lack of primary health care administration and communication system/ Poor management | 3 |
| | Bureaucracy | 1 |
| **Staff availability** | Insufficient staff/ Shortage of trained healthcare staff (specialists)/ Difficulties of employing more staff | 5 |
| **Staff training and performance** | Lack of team work | 1 |
| **Inadequate services** | Inadequate lab investigations and devices/ resources/ Insufficient lab services (lab support) | 1 |
| | Limited resources in PHCCs / Shortage of supportive services/ Lack of enough resources | 3 |
| | Lack of governmental buildings/ good buildings | 1 |
| | Incomplete pharmacy resources/ lack of some drugs | 1 |

***Groups in need:***

Healthcare managers reported that older people, disabled patients and school age children were the groups of population whose health needs are not being currently met.

***Perception of importance of prevention:***

The majority of healthcare managers rated preventing diabetes, early diagnosis by screening and preventing its complications as very important, (11, 11 and 13 respectively).

***Perception of the barriers to the use of preventive services by high risk population:***

Lack of patient health knowledge and awareness was the common barrier perceived by 7 healthcare managers. Incorrect patient beliefs, low health education, difficult access to services, lack of transport facilities and lack of motivation to participate were also perceived as barriers for high risk population to utilize the available preventive services.

***Healthcare managers' views on facilitators and barriers to the implementation of the referral system:***

The reported facilitators to the implementation of the referral system were: proper cooperation and coordination between PHCCs and hospitals, establishing an electronic

referral system, involving patients in the referral process by taking back and forth the referral and feedback sheets, auditing the referral system, and employing more healthcare staff.

The five most frequent reported barriers to the implementation of the referral system were: lack of cooperation and coordination between PHCCs and hospitals, negative staff attitude, long waiting time to enter the clinic, uncompleted and missed feedbacks and negative patient behaviours e.g. refusing to be referred and leaving before conducting all the required investigations.

***Perception of service evaluation and clinic audit:***

Nine out of 13 healthcare managers perceived that the current healthcare services they provide are evaluated and audited in a continuous manner. However, when they were asked how the services are audited, they reported different audit methods. For example, the managers from Regional Health Affairs who were interviewed reported that there is an annual standard form for collecting data which is used to audit the healthcare services at the sectoral and regional level. In the PHCCs, reviewing monthly and annually the routinely collected data was perceived also by the managers as an audit system. Three of those who indicated that the healthcare services they provide are not evaluated or audited indicated that the healthcare services should be audited while one reported that he does not know if the healthcare services should be audited or not.

### *7.4.4. Perception of needs prioritization for patients with diabetes, healthcare professionals and managers*

By asking about what the greatest needs were for people with diabetes in terms of the size of the need, its urgency, severity, impact and availability of solutions, both patients and healthcare professionals were remarkably similar (Table 51). They perceived that more drugs, laboratory services, and working staff as well as glucometers are needed. However, patients would like home care for older people while professionals prioritized having more health education materials and programs. Healthcare managers, on the other hand, were more interested to say we need first to prevent diabetes and promote health. In addition, the managers prioritized needs which are related more to their administrative responsibilities such as having computers, new governmental buildings and opening diabetes clinics on more days per week.

**Table 51: The top 10 priority needs (ranked as 1) by patients, healthcare professionals and healthcare managers**

| People with diabetes N=235 | n | Healthcare professionals N=29 | n | Healthcare managers N=13 | n |
|---|---|---|---|---|---|
| Insufficient availability of drugs (including anti-diabetes) | 35 | Insufficient availability of drugs (including anti-diabetes) | 3 | Lack of health education materials, systems, programs, clinics | 3 |
| Glucometer, its strips and needles | 33 | Lack of health education materials, systems, programs, clinics | 3 | Effective diet & nutrition programs/ control of dyslipidemia | 2 |
| Availability of Laboratory and all laboratory investigations | 22 | Availability of Laboratory and all laboratory investigations | 2 | Availability of HbA1C test | 1 |
| Home care | 7 | Increase range of insulin types available | 2 | Insufficient availability of drugs (including anti-diabetes) | 1 |
| Diabetologist clinic (diabetologist) | 6 | Glucometer, its strips & needles | 2 | Glucometer, its strips and needles | 1 |
| Specialist clinics (Family medicine physicians, specialists, trained physicians) | 5 | Insufficient working staff | 2 | Dressing materials | 1 |
| Health insurance system and financial support | 5 | Diabetologist clinic (diabetologist) | 2 | Computer and printer | 1 |
| Increase range of insulin types available | 4 | Diabetes centres (more than one) | 2 | Governmental PHCC buildings | 1 |
| Statins | 4 | Underdeveloped PHCCs/ modern PHCCs/ PHCCs with insufficient resources | 2 | Opening diabetes clinic many days per week | 1 |
| New anti-diabetes drugs | 3 | Availability of HbA1C test | 1 | Lack of good communication with patients | 1 |

### *7.4.5. Pharmacist views*

***Demographics:***

A total number of 13 pharmacists were interviewed. One pharmacist was interviewed from each PHCC and the other three were from AGH and ACH. In more detail, ten pharmacists were males, 12 were Saudis, three had a bachelor degree in pharmacy and the others had a diploma. Only three pharmacists received training courses related to diabetes and 12 perceived that they need to attend training courses on healthcare of patients with diabetes.

***Perceived supply problems and their priorities:***

Insufficient availability of drugs and provision of drugs close to the expiry dates were cited by 5 and 6 pharmacists respectively. Three pharmacists indicated that they should not themselves go to the drug supply centre and leave the PHCC pharmacy during working hours in order to bring the next instalment of drugs. They said that transferring the drugs from the supply centre to the PHCC pharmacy is not their responsibility. Delayed provision of drugs to the pharmacy and insufficient quantities of drugs supplied was reported by three pharmacists. Two pharmacists from the PHCCs suggested increasing the range of insulin types available in PHCC pharmacies to include the long-acting form of insulin (Lantus) and the dual-acting, biphasic formulation which consists of a premix of soluble fast-acting insulin human and isophane long-acting insulin (Mixtard).

Insufficient availability of drugs, provision of drugs close to the expiry dates and limited range of insulin types available for PHCC were cited as high priority problems.

***Perception of other pharmacy problems and their priorities:***

The need for female pharmacists, electronic systems, and regular updates of the drug dosage in the patients' cards were cited by 2, 2 and 3 pharmacists respectively. In addition two pharmacists mentioned that some patients ask for and insist on collecting drugs from the pharmacy without a prescription or insist on receiving a larger amount than prescribed.

The need for female pharmacists, trained pharmacists and keeping a regular update of the drug dosage in the patients' cards were cited as high priority problems.

***Perception of solutions:***

The pharmacists suggested a variety of solutions for the identified problems. Remedying the identified deficiencies, providing large amount of drugs with a long expiration dates and educating patients were the commonly mentioned solutions. Establishing electronic systems for the pharmacy, increasing the number of employed pharmacists and further support from the MOH for the PHCC pharmacies were mentioned by some pharmacists.

***Drug availability:***

As shown in table 52, some pharmacists indicated that some drugs such as glibenclamide tablets, gliclazide, regular and NPH insulin are always available in the pharmacy. On the other hand, some drugs were not always available in all the pharmacies in Abha such as metformin tablets, rapid acting and mixed insulin formulations as well as insulin syringes and test strips.

**Table 52: Availability of some drugs in the pharmacy**

| Drug | Always available | Sometimes available | Not available | Total |
|---|---|---|---|---|
| Metformin | 10 | 3 | 0 | 13 |
| Glibenclamide | 13 | 0 | 0 | 13 |
| Gliclazide | 13 | 0 | 0 | 13 |
| Glipizide | 4 | 0 | 9 | 13 |
| Glinide | 0 | 0 | 13 | 13 |
| Aspart or Lispro (Rapid-acting) | 2 | 2 | 9 | 13 |
| Regular insulin (Short-acting) | 13 | 0 | 0 | 13 |
| NPH insulin (Intermediate-acting) | 13 | 0 | 0 | 13 |
| A mixture of NPH and regular insulin | 10 | 3 | 0 | 13 |
| Anti-hypertensive drugs: Angiotensin-Converting Enzyme Inhibitors, Beta-blockers, diuretics | 12 | 1 | 0 | 13 |
| Cholesterol-lowering drugs: statins | 6 | 1 | 6 | 13 |
| Consumables: needles, syringes, urine test strips, capillary blood glucose test strips | 9 | 1 | 3 | 13 |
| I.V. Glucose solution | 10 | 2 | 1 | 13 |

***Methods of drug supply:***

The pharmacists in the PHCCs reported consistent procedures for drug supply which include:

1. The nurse of the diabetes mini-clinic calculates the total amount of antidiabetic drugs and insulin needed for each patient by reviewing patients' files.
2. The nurse then sends the total amount of drugs required for all patients to the pharmacist.
3. The pharmacist sends a request for the required amount to the health sector administration.
4. The health sector then sends the request to the drug supply centre.

5. The pharmacist then goes to the drug supply centre to collect the required amount.

In hospitals, the steps of drug supply are slightly different where the pharmacy coordinator requests every month the required amount from the drug store of the hospital. It is the responsibility of the drug store to make sure that there are drugs available by requesting them every month from the drug supply centre or buying them directly from the drug companies. In the same way, the pharmacists in hospitals are responsible for collecting the requested amounts of drugs from the drug supply centre.

### *Methods of dispensing drugs:*

The pharmacists reported similar methods for dispensing diabetes drugs to patients. First, the patient should bring a prescription from a physician and his/her diabetes card which contains information about the dosage and amount of drugs needed. The pharmacist then dispenses medication to patients every 2 or 3 months in PHCCs and every month in hospitals or as requested in the prescription. The pharmacists are responsible for recording the amount dispensed in the diabetes card of the patient. Drugs close to the expiry date are dispensed first.

***Training needs:***

The pharmacists indicated that they would like to attend several training courses. Six of them reported that they need to attend courses on quality assurance and drugs update. Some pharmacists reported the need for courses on methods of drug dispensing, drug safety, drug preparation and healthcare management. Some pharmacists showed interest in attending courses on how to communicate with and educate patients about drugs.

## 7.5. Discussion

### 7.5.1. *Principal findings*

This study is the first exploratory description in Saudi Arabia for the views of diabetes patients, healthcare professionals and managers from the primary and secondary healthcare on the unmet needs of patients, the unavailable healthcare services that the MOH should provide and how services could improve. There was agreement between patients, professionals and managers that there is a need for more laboratory services, drugs and working staff. Insufficient availability of these needs was also perceived as healthcare problems. This would indicate that these are real problems and should be given a priority for action.

However, there were also some important differences between patients, professionals and managers. For example, the patients made complaints about staff attitude and behaviours while the professionals in contrast made complaints about patient compliance and knowledge. On the other hand, the managers were interested in provision of health education and promotion as well as reporting administrative problems such as the need of the PHCCs for more support and commitment from higher authorities and lack of motivation and incentives for the primary healthcare staff. The pharmacists also reported that there is insufficient provision of drugs and raised different concerns such as provision of drugs which will expire soon and provision of limited types of insulin. These differences show the importance of interviewing different key informants where different definitions of need correspond with different groups of the population.[282]

The insufficient availability of laboratory, pharmacy (drugs) and health education resources for diabetes care in primary healthcare settings was consistent with what has been reported by several studies in Aseer region.[256-257, 270, 283] These insufficiencies were thought to play an important role in making programmes targeting chronic diseases such as diabetes less effective.[138, 256-257, 269-271] Therefore, it is important to address these insufficiencies and provide all PHCCs with adequate resources according to their actual needs; particularly for important services such as HbA1c test, podiatry services and dietetic services which were perceived to be unavailable.

Inappropriate referral and appointment systems particularly in hospitals were perceived as a problem by most of patients and professionals and some managers. This confirms what previous studies reported about the need to improve the referral and appointment systems.[138, 265, 270] Further research is needed to evaluate the current referral and appointment systems and to identify interventions that are effective in improving these systems.

While there was some agreement between patients, professionals and managers about the barriers to service improvement, there were also some important differences. For example, some professionals reported barriers which are related to their work experience such as bureaucracy, inefficient systems, routine work and lack of cooperation between healthcare levels. In the same way, some healthcare managers reported different barriers such as lack of leadership, lack of team work and weak coordination between different governmental sectors. Further exploration of barriers to service improvement is needed in order to be able to develop interventions that can overcome these barriers and successfully improve diabetes care.

It was important to ask about health needs of people with diabetes in different ways. This is because the informants perceive some issues as needs while others perceive them as problems. For example, 31 patients perceived that long appointment waiting list is a problem in hospitals while only 1 patient out of 235 patients perceived this issue as a need. In the same way, 54 patients perceived that they need free glucometers from the PHCC while only 8 patients perceived unavailability of free glucometers as a problem in PHCCs. Therefore, asking in different ways helped to gather a comprehensive list of needs and problems as shown in appendix 19.

The similarity among key informants in reporting needs, problems and even priorities could be due to some of the following factors. First, patients with diabetes have a wide experience of service use because of their need to frequently use the healthcare services. This will help patients to be able to provide insight into the type of needs that other patients would have and identify deficiencies similar to healthcare professionals. Second, it is still possible that the views of physicians who interviewed patients might influence the views of patients.

Overall, this study shows that patients with diabetes have a high level of healthcare needs. It shows also that patients are concerned about their management and reported insightful responses. Their perception that the primary healthcare services they receive are underdeveloped and inappropriate might affect their self-care and self-management and consequently their diabetes control. In addition, the low priority for disease prevention by patients may suggest that preventive interventions will struggle to succeed and education is a challenge.

### 7.5.2. *Limitations*

The study is a step forward in using the views of key informants to understand the current deficiencies and how to meet needs and improve services. It involves eliciting the views of local key informants which is the most appropriate method sensitive to local concerns and circumstances.[228, 284] However, the representativeness of the interviewed sample of stakeholders might be limited by the methods of recruiting participants and the characteristics of the obtained samples.

For patients, the views of local patients who did not access or were unable to access the healthcare services during the study period were not sought. This might particularly lead to under reporting the barriers to accessing services. Further, more male patients (70%) were interviewed than female which might cause under reporting of female related issues. Although, the use of systematic sampling technique would result in a representative sample of patients, it would have been better to take a separate sample from men and women subgroups of patients. Recruiting a sample of patients with a majority of male patients might be due to having few female interviewers. The female patients might prefer to be interviewed by female interviewer and because 11 out of 14 interviewers in the research team were male, this perhaps leads female patients to refuse to participate. This interpretation however is difficult to confirm because the researchers did not collect data about those who refused to participate.

Additionally, it is possible that some patients may be reluctant to explicitly state their views, either because they don't believe that their views will be taken seriously or because they think this may have a negative impact on the services they receive. In

spite of this, the participant's information sheet was designed to explain the benefits of the study in a way to encourage patients to give clear and honest responses.

Small purposive samples of professionals, managers and pharmacists were interviewed. This reliance on a small number of participants who may be biased in their perceptions and may not represent the views of the more general population is one of the disadvantages of this study. Moreover, the health professionals, managers and pharmacists have a personal stake in the outcome of the healthcare which might bias the reported needs and problems. However, they are presumed to have the broadest experience and knowledge of needs, problems and current service provision which make them the best representative sample that can provide informative answers.

The study also sought the views of key informants in prioritizing needs and problems. The views of informants and their priorities are important to consider in planning for solutions. However, local priorities identified are linked with other considerations like equity, effectiveness and costs which should also be considered for decision making.

Inability to record the interviews can be considered as an advantage and disadvantage at the same time. It is an advantage because, culturally, taking notes instead of recording gives participants more willingness, freedom and comfort to answer the questions while recording might lead them to be more reluctant and conservative. On the other hand, it is a disadvantage because it requires the interviewer to think, interpret and understand what the interviewee said before writing the notes. This process of listening, interpreting and writing might involve interviewer's bias in writing the correct responses. To minimize this bias, the interviewers were asked, at the end

of each interview, to give the interviewee the chance to review the notes taken and correct or change any response. In addition, it is possible that interviewers might miss some responses during writing notes due to several reasons.

## 7.6. Conclusion

In summary, a number of areas for improvement were identified. These included the need for:

- Adequate provision of all diabetes care resources which include laboratory, pharmacy and manpower resources.
- Adequate, flexible and responsive healthcare system to meet patients' needs.
- Improved and efficient system for drug provision that ensure continuous availability of antidiabetic drugs and standard equipment in PHCC pharmacies.
- Well organized diabetes care pathway at the PHCCs and at the level of secondary and tertiary healthcare.
- Commitment and support from higher authorities in the MOH.
- Well implemented diabetes mini-clinic programme in PHCCs.
- Provision of adequate and easy accessible podiatry and dietetic services
- Adequate referral and appointment systems which should improve the communication and coordination between healthcare professionals and patients, and between primary care and hospital clinicians.
- Healthcare staff to enhance their attitude and skills in managing people with diabetes through staff training and continuous professional development.

- Easy access to health education and promotion programmes, materials and clinics that provide regular information and support according to the patient's needs and capabilities.
- Designing interventions to improve patients' compliance.
- Establishing electronic healthcare systems which should include electronic health records, electronic appointment and referral system, electronic pharmacy system.
- Adequate home care for bedridden patients and those with difficult accessibility.
- Establishing adequate facilities for physical activities such as boardwalks and gyms.
- Adequate auditing system for healthcare services.

Many of the needs and problems identified in this study could be addressed by establishing a managed clinical network and quality assessment and improvement system in the primary health care. The knowledge and experience of patients should be involved in the process of planning for improvement. Further large studies at the regional and national levels are needed as well as annual patient satisfaction audits.

# CHAPTER EIGHT

# Healthcare leaders' priorities

*This chapter reports the results of a survey with healthcare leaders to explore their perceived priorities for a number of recommendations to improve diabetes care in Abha city. The principal findings and limitations of the survey are discussed.*

# Chapter 8: Healthcare leaders' priorities

## 8.1. Introduction

Need and demand for healthcare always exceeds the funding that is available to the Ministry of Health (MOH). It is important to involve different stakeholders in priority setting. Several methods have been proposed for establishing needs priorities. One approach is to ask the participants to give each need area a numeric rank score.[285] In the previous chapter, people with diabetes, healthcare professionals and healthcare mangers were asked to prioritize the needs they perceived by ranking them from one to five where one was the first priority. In this chapter, the healthcare leaders will be involved in priority setting.

The role of leaders in health services priority setting was described and explored by Reeleder and his colleagues in 2006.[286] They emphasized the key role of healthcare leaders in priority setting. They also prescribed several leadership practices for priority setting and its benefits to achieve proper and fair prioritization. The healthcare leaders are in a position to identify the changes that have the greatest impact on patient wellbeing. Their role is also central to implementing the changes identified or the recommendations made.

## 8.2. Objectives

In this study, the aim was to explore the views of healthcare leaders on the priority of specific recommendations to meet the identified needs and gaps in service provision which were reported in the previous chapters.

## 8.3. Methods

### 8.3.1. *Methods of constructing the questionnaire*

A questionnaire for healthcare leaders to explore their prioritization on some suggested recommendations was developed (Appendix 20). The identified health needs and gaps in service provision that were reported in the previous chapters (7-9) were listed. By reviewing this list, the findings were then categorized into different groups which resulted in the following 12 groups:

1. National policies and strategies of diabetes care
2. Clinical practice guidelines
3. Health care service computerization
4. Occurrence of diabetes
5. Demographic issues
6. Diabetes risk factors
7. Population health status
8. Healthcare utilization
9. Current diabetes service provision
10. Mini-clinic resource evaluation

11. Health Education

12. Preventive services

The suggested solutions to meet the identified needs that were reported by patients, healthcare professionals and managers in chapter 7 were reviewed by the researcher (AA). Based on these suggested solutions, several recommendations to meet the identified needs or to close the identified gaps were suggested by the researcher (AA), at least one for each group of findings. This analysis was completed after the first field work. The researcher (AA) then return to Saudi Arabia for the second phase of field work to ask the healthcare leaders to prioritize the suggested recommendations. The healthcare leaders were asked to rate the priority of each recommendation on a rating scale of 0-100%, where 0% was the lowest priority and 100% was the highest priority.

### 8.3.2. *Methods of sampling and questionnaire administration*

Purposive sampling was used to identify those healthcare leaders who are involved in planning, commissioning or supervising diabetes care in Abha city. A printed copy of the questionnaire was given in person to each participant to be completed within 7 days. The completed questionnaires were then collected by the researcher (AA) after one to two weeks.

### 8.3.3. *Methods of analysis*

The data were entered and analysed using the Statistical Package for Social Sciences (SPSS) software, version 20. The mean priority rate was calculated for each recommendation by adding up all the 16 scores then dividing the sum by 16. For analysis purposes, the recommendations were reviewed by 3 independent reviewers (AA, IC, LI) and a consensus was reached to categorize the recommendations into 7 themes. These themes were related to:

1. Prevention of diabetes
2. National policies and strategies of diabetes care
3. Healthcare process and utilization
4. Data availability
5. Diabetes service provision (resources, workforce)
6. Auditing and evaluating healthcare services
7. Health care service computerization

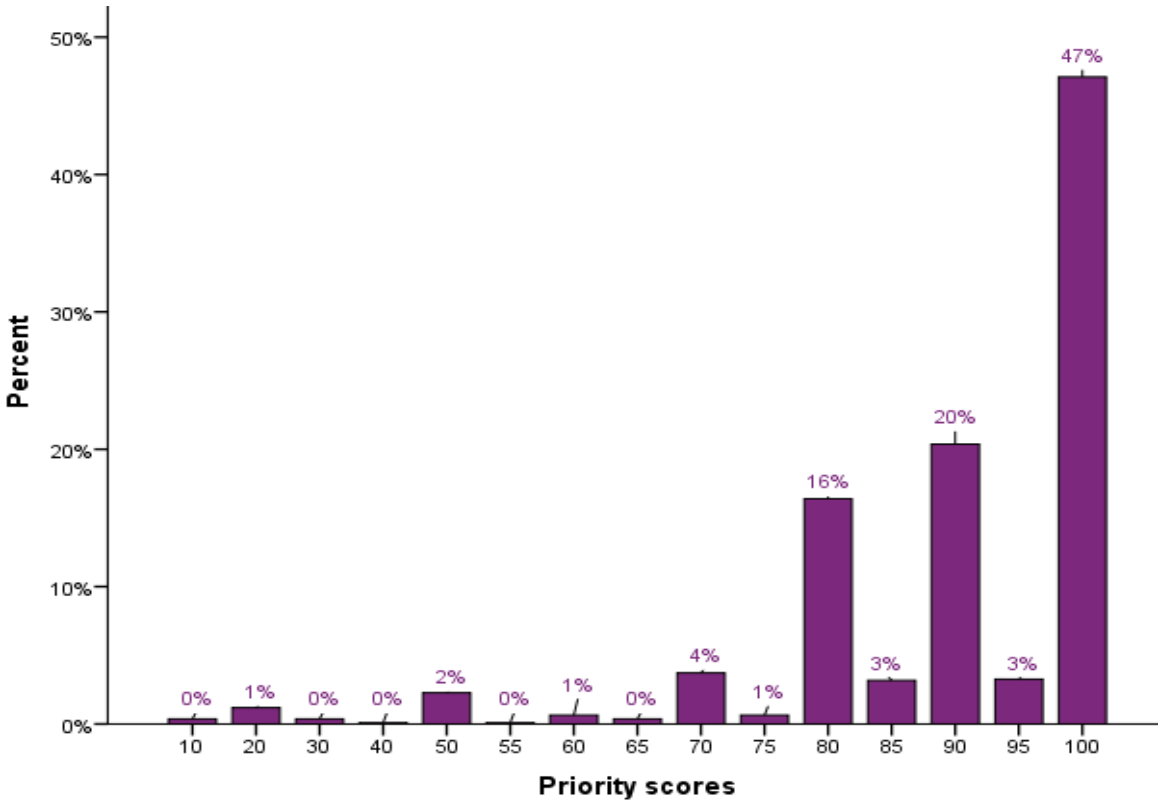
The mean priority scores for the recommendations of each derived theme were then compared to the median for all the mean scores of the recommendations.

## 8.4. Results

The questionnaire was given to 18 healthcare leaders. Sixteen healthcare leaders responded and completed the questionnaires and two did not return the questionnaire. All the respondents were male leaders who work in the Regional Health Affairs (RHA).

Figure 31 shows that most of the recommendations were rated of high priority (70-100%); 94.7% of all the scores (1104) were 70% or above. The median score was 95%. The lower and upper quartiles were 80% and 100% respectively.

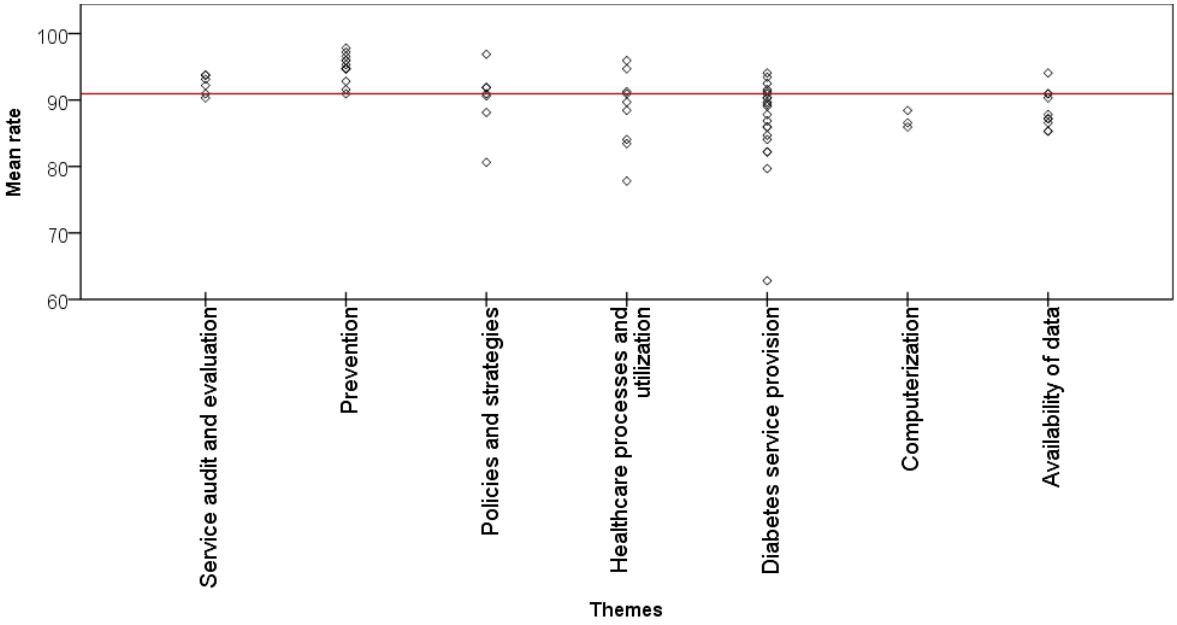
**Figure 31: The frequency of reported priority scores for all the recommendations**




The themes and recommendations with their mean priority scores are presented in appendix 21. The mean priority scores for each recommendation are presented in

figure 32 by themes. As shown, the median for the means was 90.94% (red line). Almost all the mean scores of the recommendations in the prevention and service auditing themes were above the median. The mean scores of the recommendations regarding the computerization of healthcare services were all below the median.

**Figure 32: The mean priority rate for all recommendations within each theme**




*Red line is the median=90.937%*

The mean priority scores of the recommendations of other themes such as policies and strategies, healthcare utilization and diabetes service provision had a wider range. For example, within the theme of policies and strategies for diabetes care, the top priority was the need for a national quality assurance manual for diabetes care at hospital and diabetes centre (96.8%). In contrast, the lowest priority was for the need to implement, monitor and evaluate the Gulf Executive Plan for Diabetes Control (80.6%). For the theme of healthcare processes and utilization, the top priority recommendation was for the need for high quality diabetes care to reduce the burden of diabetes complications (95.9%). In the same theme, the bottom priority

recommendation was about the need to increase referral rate to hospital for annual review and hospital feedback to 100% (77.8%).

For the diabetes service provision theme, the top priority was for a tertiary care hospital in Abha city for eye care (94.1%) and the lowest priority was for employing more x-ray technicians (62.8%). For the data availability theme, the top priority recommendation was about the need for recording routinely the number of diabetes related follow-up visits in Almansak PHCC (94.1%); the lowest priority was about recommending that data on gestational diabetes be made available (85.3%).

The top 20 priority recommendations are shown in table 53. Most (eleven) of these recommendations were related to the prevention theme, 3 related to service audit and evaluation, 2 related to diabetes service provision theme, 2 related to healthcare processes and utilization, 1 related to data availability and one related to policies and strategies for diabetes care.

### Table 53: The top 20 priority recommendations according to the mean score

| Recommendations | Mean score |
|---|---|
| Activating and enhancing the mini-clinic screening program is needed to identify undiagnosed diabetes. | 97.81 |
| There is a need to promote physical activity and diet control. | 97.19 |
| National quality assurance manual for diabetes care at hospital and diabetes centres is needed. | 96.88 |
| Annual review and examination needs to be implemented effectively and completely. | 96.56 |
| Effective public health interventions are needed to reduce the burden of diabetes. | 95.94 |
| Effective interventions to improve monitoring of blood glucose and its control is needed. | 95.94 |
| High quality of diabetes care is needed to reduce the burden of diabetes complications. | 95.94 |
| Foot screening for those patients with diabetes at high risk is needed. | 95.31 |
| Effective national and local action to tackle obesity is urgently needed. | 94.69 |
| Health education program need to be implemented efficiently and effectively. | 94.69 |
| The programmes of screening for diabetes and its complications need to be enhanced and implemented effectively and also evaluated for its effectiveness. | 94.69 |
| Retinopathy screening program for all patients with diabetes is needed. | 94.69 |
| The gap between estimated prevalence and actual (registered) prevalence of diabetes need to be closed. | 94.69 |
| Almansak PHCC must record routinely the number of diabetes related follow-up visits. | 94.06 |
| There is a need for tertiary care hospital in Abha city especially for eye care. | 94.06 |
| Need to audit diabetes services at the national and regional level. | 93.75 |
| MOH Diabetes centre services need to be audited and evaluated. | 93.75 |
| There is a need for provision of HbA1C machine at all PHCCs and ADC. | 93.44 |
| Mini-clinic program for chronic diseases at PHC need to be audited and evaluated to measure its implementation and effectiveness. | 93.13 |
| Enhancing and supporting the new health promotion initiative and merging the mini-clinic screening program within its activity should be considered. | 92.81 |

## 8.5. Discussion

### 8.5.1. *Principal findings*

The healthcare leaders perceived most of the recommended solutions and interventions as high priority. This could be because the researcher identified the important needs and gaps which should be tackled. This led healthcare leaders to give high priority to most of the recommendations. It also confirms that there are many issues need to be addressed.

The healthcare leaders rated the recommendations on prevention or health promotion perspectives as the highest. Healthcare managers gave similar responses (previous chapter). This could indicate that those who work in managing and commissioning healthcare services, whether they work in the RHA or as managers in local hospitals and PHCCs, have more interest in improving the preventive services and promoting health. It is possible that they both have a long term views on the scale of the problem of diabetes in Saudi Arabia. Thus, their concern is to try to prevent the future rise in demand for diabetes care by focusing on prevention rather than on increasing service provision.

Moreover, the leaders gave consistently high priority to auditing and evaluation of diabetes care. This might be because they perceived that auditing diabetes services would help them in commissioning, planning and improving diabetes care. This perception was supported by some of their quotes. For example, one leader wrote “auditing would help for proper planning and improvement”. Another leader wrote “continuous audit means continuous improvement” and “audit would help for planning and decision making”.

The recommendations to computerize the healthcare services were given lower priority scores. This could be due to the previous failed attempt to computerize the primary healthcare services. However, it is important to computerize the healthcare systems because this will help to provide proper administration and collect accurate and easy accessible data which in turn will support conducting service audit and evaluation. A participant when asked why he gave computerization of healthcare system 100% priority wrote “because it will be easier to follow and collect data”.

### 8.5.2. *Limitations*

This study is not a formal priority setting exercise and did not aim to prioritize needs by conducting a robust priority setting processes. It just describes the participants’ views on perceived priority of specific recommendations to improve diabetes care. One of the weaknesses of this study was that it did not determine specific criteria to consider for prioritizing the recommendations. Therefore, each participant might have used different considerations for priority rating. For example, the cost of the recommendation was not explicitly taken into account.

Another weakness was the involvement of a small sample size which limits the interpretation and generalizability of the findings.

Although, some recommendations were given higher priority mean scores than others, the small differences between mean scores limit the prioritization process. Therefore, the interpretations should be cautious.

## 8.6. Conclusion

The healthcare leaders in Abha city attached high priority to meeting identified needs and closing identified gaps in service provision. Improving the preventive services and establishing an audit system for diabetes care were given particularly high priority.

Need and demand for healthcare always exceed the funding available. Therefore, proper priority setting is required to prioritize the identified needs into those that will be met and those that will not. Achieving this is a challenging task which requires robust and fair priority setting processes. These should balance competing needs and achieve rational resource allocation. The next step, which includes developing effective interventions, planning for effective implementation and overcoming barriers, is also a challenge.

# CHAPTER NINE

# Overall discussion and conclusion

*This chapter discusses the key findings of the whole research project and the implications of these findings for service improvement. Recommendations are made for future developments in diabetes care. Major priorities for research are identified.*

# Chapter 9: Overall discussion and conclusion

## 9.1. Principal findings

The findings of this research showed suboptimal achievement of several targets and indicators of quality of care covering measures of structures, processes and outcomes of diabetes care. This chapter will discuss some of the key findings of this thesis.

### *9.1.1. Assessment of diabetes outcome measures*

This study in Abha city found that a large number of Saudi patients with diabetes are not achieving recommended levels of glycemic, lipid and BMI control and are therefore at high risk of diabetes complications. The analysis of patient case notes showed that 80% of patients, who had their FBG measured within the preceding 12 months, did not achieve the target of FBG ≤ 126 mg/dl (7 mmol/l). In addition, more than 40% had poor glycemic control of > 180 mg/dl (10 mmol/l). These results are consistent with those of previous studies across different regions of Saudi Arabia.[104-107] Although HbA1c has become the standard assay for managing and monitoring glycemic control, few patients (4%) in the PHCCs of Abha city had a record of HbA1c. In Aseer Diabetes Centre (ADC), 403 patients (73%) had a record of HbA1c and more than 83% of them had HbA1c values higher than 7% while 76% had HbA1c values higher than 7.5%. In all the neighbouring gulf countries, inadequate glycemic control of having HbA1c > 7%

was consistently reported in more than half of patients with T2DM.[110] A lower proportion was reported in Jordan where almost 44% of T2DM patients had HbA1c values of more than 7%.[287] In developed countries such as Scotland and England, 44% and 33% of patients with a record of HbA1c had values of more than 7.5% respectively.[288-289]

The proportions of overweight and obese people with diabetes in Abha city were similar to what has been reported recently in Scotland. More than 85% of adult patients (≥ 20 years) with diabetes in Abha city were either overweight (33%) or obese (53%). A recent study which included 61% (14252) of all patients with diabetes in Aseer region showed similar proportions of overweight and obesity among people with diabetes (36% and 46% respectively).[290] Similarly, in Scotland almost 85% of adults (≥ 18 years) with diabetes were either overweight (32.3%) or obese (52.5%).[288] However, for those patients who have their total cholesterol measured and recorded, almost half of patients (47.3%) in Abha compared with 20.5% in Scotland had total cholesterol level higher than 195 mg/dl (5 mmol/l).

Another assessed outcome indicator was blood pressure (BP) control. This study found that 22% of patients with diabetes had BP readings (the most recent) higher than 130/80 mmHg. In Scotland however, the Scottish Diabetes Survey in 2012 showed that a higher proportion of almost two thirds (66%) of patients with diabetes had BP readings higher than 130/80 mmHg. This thesis also found that only 22.5% of the patients with diabetes had a diagnosis of hypertension. This proportion was also lower than what has been reported from other studies in different regions of Saudi Arabia which range from 33 to 37%.[85, 291]

These findings raise concerns on the measurement and recording BP readings for people with diabetes in Abha city. For example, in Scotland, 93.6% of people with diabetes had their BP recorded within the preceding 15 months while in Abha city only 65% had their BP recorded within the preceding 12 months. It is expected that those patients who did not have their BP measured in the preceding 12 months would have higher readings than those who were compliant with their follow-up appointment. This could explain in part why, in comparison to Scotland, a smaller proportion of patients with diabetes in Abha had BP readings higher than 130/80 mmHg. Another possible explanation for this might be that BP is not measured routinely for all patients either during their follow-up visits to the PHCCs or annual review in hospitals (only 54% of patients have their BP measured during the most recent hospital review). This would lead to missing more patients with high BP readings.

Despite these inadequacies in the health status of people with diabetes in Abha city, one unanticipated finding was that most of the interviewed patients did not perceive that good glycemic control, weight reduction or lipid control are unmet needs or a problem that should be given a priority to tackle. This would indicate that the patients, when asked about their health needs and diabetes management problems, usually do not think about themselves and their diabetes control but rather about other issues related to the availability of services and processes of care. This might be because they think that if all the resources were available and the processes of care were appropriate, control of their diabetes would improve. On the other hand, the low level of concern might be instead a result of patients' lack of awareness of the importance of achieving good glycemic, lipid and weight control. The finding that health education

was not frequently given could partly explain this lack of patients' awareness. In addition, the healthcare professionals' responses supported that by frequently reporting poor patient compliance and lack of patient knowledge as problems in diabetes care. This is consistent with the findings of a recent survey among physicians in the Middle East and North Africa which showed that physicians identified the patient factors as the most important barriers to optimal diabetes care.[292]

Poor glycemic control has been shown to increase the risk of diabetes complications.[13, 293] Contrary to expectations, the reported inadequate glycemic and lipid control in Abha city was accompanied by lower than expected prevalence of diabetes complications. Of reviewed patients (4458), 22.5% had hypertension, 10.5% had retinopathy, 2.9% had ischemic heart disease, 1.8% had nephropathy and only 1.4% had cerebrovascular disease. In addition, the proportions of peripheral arterial disease, neuropathy and foot problems were almost lower than 1%. By comparing with the prevalence of diabetes complications in developed countries with high quality diabetes care,[261] it is clear that the prevalence of diabetes complications in this study was lower than would be expected. This poor identification of diabetes complications is probably attributed mainly to several inadequacies of the care processes of identifying these complications. Low referral rate to hospital for annual review and the lack of performing or recording some clinical examinations such as foot examination are examples of these process inadequacies. On the other hand, a multi-faceted approach involving issuing guidelines, staff training, service evaluation and frequent auditing could increase examination frequency. For instance, an evidence based diabetic foot examination reminder, which was implemented in a PHCC in Saudi

Arabia, showed a dramatic improvement in performing foot examination from 7.8% to 52.7%.[294]

Although it is not possible to prevent T1DM, there is evidence suggesting that it is possible to prevent T2DM, or at least delay its onset, by preventing obesity and promoting physical activity.[295-296] Therefore, in Saudi Arabia, it is necessary to implement interventions to reduce the incidence of T2DM which aim to increase physical activity, promote healthy eating and prevent or at least reduce overweight and obesity. Research is needed to help in developing and identifying the most effective and efficient interventions that is suitable for the Saudi populations and circumstances.

It is now generally accepted that early diagnosis and treatment of people with T2DM can help reduce their risk of developing complications and the costs associated with diabetes management. Therefore, it is recommended to screen for T2DM those asymptomatic, undiagnosed individuals who are at increased risk of developing diabetes.[14, 37, 250, 297] It should become a routine part of diabetes services once a working system of care is in place. Although the screening of those at increased risk of developing diabetes is one of the components of the diabetes mini-clinic programme, few patients were diagnosed annually due to the implementation of this programme (5% of the interviewed patients). The study estimated that in 2011, 73% (12988) of people with diabetes in Abha city are still undiagnosed. This large number of people with undiagnosed diabetes will increase the likelihood of presenting with long-term complications at time of diagnosis, which will increase the cost of their management. Therefore, improving the implementation of the screening programme should be

considered. At the national level, the estimated proportion of undiagnosed diabetes is 77.4%.[37] In the high-income countries of the Middle East and North Africa region, the proportion of undiagnosed diabetes was estimated to be 40.7%.[298] Globally, the IDF estimated that close to half (45.8%) of those who have diabetes are undiagnosed; ranging from 24-75% across IDF region and income groups.[298] This shows that Saudi Arabia had a higher proportion of undiagnosed diabetes than neighbouring countries with similar high income.

In addition, although the population-wide screening for diabetes in not recommended in some developed countries, [14, 37, 250, 297] its implementation in Saudi Arabia might be effective due to the high prevalence of diabetes and undiagnosed diabetes in the country. Some statistical models showed that identifying each case of undiagnosed diabetes in Taiwan was more cost-effective than in the USA.[299] The proportion of undiagnosed diabetes was higher in Taiwan than in the USA (46.7% versus 27.7%).[37] In Taiwan, the cost per quality-adjusted life-year (QALY) gained from earlier detection and treatment of each case of undiagnosed diabetes was estimated to be around US$ 17,800, which compares favourably to the USA where the cost was US$ 56,600 per QALY gained.[299] This comparison between Taiwan and the USA emphasize that the cost-effectiveness of population-wide screening is sensitive to the prevalence of undiagnosed diabetes. Therefore, population screening for T2DM should be studied for its cost-effectiveness and clinical benefits within the Saudi community. Another important consideration is whether the capacity of the healthcare system is sufficiently able to treat the newly identified patients.[299]

### 9.1.2. *Assessment of service resources and process of care*

A wide gap exists between our standards and knowledge of effective diabetes interventions and their implementation in practice. Several deficiencies in service provision were identified and several related concerns were raised by the key stakeholders. These deficiencies were related to either the issue of availability of specific resources and services or the issue of poor implementation of some care services. Table 54 shows the main consistent deficiencies in care across the different methods used. Inadequacies of the process measures of diabetes care were found in all the PHCCs with marked variation between them.

**Table 54: Triangulation of key findings across different methods**

| Findings | Research methods | | | | |
|---|---|---|---|---|---|
| | Routine data | Standard checklist | Questionnaires | Case note reviews | Interviews |
| Low prevalence | √ | | √ | √ | |
| Insufficient medications | | √ | | √ | √ |
| Insufficient lab resources | | √ | √ | √ | √ |
| Insufficient staff | | √ | √ | | √ |
| Insufficient health education resources | | √ | √ | √ | √ |
| Inadequate health promotion | | | √ | | √ |
| Inadequate podiatry and dietetic services | √ | | √ | √ | √ |
| Inadequate Referral system | | | √ | √ | √ |

Insufficient availability of medications, healthcare staff and laboratory resources were findings of most of the approaches used. For example, reviewing the patient case notes showed inequity in prescribing of some drugs such as aspirin and statins. Evaluating what medications are available in each PHCC showed that mixed insulin (Mixtard) was available in Almanhal and Wasat Abha PHCCs while the Lantus pen was only available in Almanhal PHCC. At the same time, patients and healthcare professionals as well as pharmacists frequently perceived that the availability of medications in the PHCCs is insufficient.

In the same way, the insufficient availability of laboratory resources was reported by most of the different approaches used in this research. For example, evaluating service provision showed that there is no laboratory in Johaan PHCC and that HbA1c test and blood electrolytes were not available in any of the PHCCs. Reviewing the patient case notes showed for example that HbA1c was measured for only 4% of patients and FBG was measured for 60% of patients. Insufficient or unavailable laboratory services were one of the most frequent perceived needs reported by interviewed patients, healthcare professionals and managers. A recent survey of 1082 physicians in five countries including Saudi Arabia showed that the Saudi physicians perceived a lack of laboratory facilities as a problem and identified inadequate laboratory facilities as a potential barrier to optimal diabetes care.[292]

Availability of well trained staff was also an important issue of diabetes care in Abha city. Reviewing the current provision of care services showed that, in Abha city, there are no specialists in podiatry, nutrition and diet or health education. The foot clinic and health education clinic in ADC are run by interested nurses who have had limited

training while the dietetic clinic is run by two dieticians. The numbers of specialist general physicians, laboratory technicians and x-ray technicians are not sufficient. In addition, there was a need for equitable redistribution of the working staff based on the number of people registered at each PHCC. Moreover, when the patients, healthcare professionals and managers were asked about the healthcare needs of patients with diabetes, they all perceived that the current number of staff is not sufficient and there is a need for more well-trained staff in different specialities at both primary and secondary healthcare.

The need to improve the annual referral of patients to hospitals for checkups was also indentified by three approaches used in this study (Table 54). Reviewing how the diabetes care was delivered showed that there are no explicit criteria and guidelines for organizing the methods of referring patients to hospitals and receiving feedback. On the other hand, the analysis of patients' case notes showed that only 45% of people with diabetes were referred to the hospital for annual checkups in the preceding 12 months with marked variation between the PHCCs. Additionally, many patients, healthcare professionals and managers who were interviewed repeatedly reported concerns and difficulties in this system particularly in hospitals. Further studies are needed to explain why this variation in referral rates exists and what effective interventions could help to improve the referral system.

Reviewing the current provision of diabetes care showed that there is a need for national policy statements, strategies, action plans and updated quality assurance guidelines in order to improve the organization and delivery of diabetes care. Developing effective interventions to improve all the components of diabetes care

including prevention of T2DM; diagnosis; initial management; education; follow-up care; and regular screening for and treatment of complications are needed. Some interventions have shown promising effects in improving the processes of diabetes care in Saudi Arabia. For example, developing a computer programme for physicians to generate an evidence-based checklist of clinical and biochemical screening tests needed for patients with diabetes at each visit showed significant improvement in screening for diabetes complications. This intervention significantly improved the percentage of patients being screened for diabetic retinopathy from 24.7 to 98.5%, neuropathy from 25.9 to 92%, and nephropathy from 37.8 to 73.7% in a primary healthcare setting in Riyadh. However, this intervention did not show any improvement in the glycemic control.[300] Moreover, using an evidence-based diabetic flow sheet in the patient records improved performance on 7 out of 9 process indicators of diabetes care. The difference in improvement was 40% for measuring the BMI, 36% for testing lipid profile, 29% for HbA1c, 24% for peripheral neuropathy examination, 23% for examining foot, 18% for retinoscopy and 14% for microalbumin testing.[301]

## 9.2. Challenges of the field work

Assessment of diabetes care in a developing country was a major undertaking. Designing and conducting the research project required to consider the complexity of diabetes care and the lack of electronic healthcare systems and records in Saudi Arabia. Therefore, several methods of research were designed to collect data on diabetes care from different sources. These methods included semi-structured interviews with key stakeholders encompassing patients, healthcare professionals, managers and pharmacists; standard checklist for evaluating available resources; analysis of routine healthcare data; questionnaires to medical directors and healthcare leaders; and examination of the case notes of patients with diabetes. These methods were designed to be culturally acceptable, fit the nature of the paper-based healthcare system and ensure feasible, doable and successful conduction. Getting access, constructing the research teams and getting approval required extensive efforts. In addition, limited fund, resources, available time and limited available data were all major difficulties. The approval and support of the Saudi MOH was essential in obtaining access to different data sources and developing the research teams. Conducting the research project during the working hours was also a difficult task. The working staff was busy with their daily work duties. With the support of the MOH, which offered the nurses who worked in the team 2 free days per week for 2 months, this task was achieved well. 97% of the case notes were reviewed by nurses and 290 key informants were interviewed by the physicians. In the first two weeks, the main researcher and the supervision teams double checked the filled forms to ensure the data were extracted accurately and the forms were filled in completely. The project was interrupted by two measles vaccination campaigns and the hajj holiday. However,

with this recruited enthusiastic teams, we were able to overcome these difficulties. More members were recruited in the PHCCs with high workload and one nurse was moved to help any PHCC team when needed. Doing this kind of research is difficult; however, with advanced planning and using modified feasible research techniques, this help to conduct the project successfully.

## 9.3. Strengths and limitations

### 9.3.1. *Methods used*

This is the first study that has used multiple approaches to assess diabetes care at both the primary and secondary healthcare level in a whole city in the Kingdom of Saudi Arabia. It is the first study that has assessed diabetes care by analysis of the routine healthcare data in conjunction with data from patient case notes and interviews with key stakeholders. The methods included first evaluating the current diabetes services through assessing the availability of the resources of diabetes care and whether specific diabetes services are delivered or not. A standard service checklist and service provision questionnaires were used in addition to collecting and analysing routine healthcare data to achieve a comprehensive assessment. Second, the records of patients with diabetes were reviewed using specific developed form to evaluate several process and outcome measures of diabetes care. Third, interviews with key informants including users, providers and managers of diabetes care were undertaken to gain insight into their views and priorities regarding patient needs and deficiencies in diabetes care. Four specific semi-structured interview schedules were developed and used for this purpose.

### 9.3.2. *Rationale and limitations of each method*

Each of the methods used has its own strengths and limitations. The first approach, which aimed to assess the availability of specific checklist of diabetes care resources and services, used both direct inspections of the PHCCs resources and asking by face-to-face interviews the best placed clinicians whether specific diabetes services and resources are available or not. This approach was used because of the lack of routine data or reports that can provide information on the available resources. However, the methods used did not assess whether the available resources are adequate in terms of their amount, type and condition. Also, they did not assess whether these resources have been used appropriately.

Interviewing the lead clinicians about resource availability might involve response bias. The clinicians might underestimate or overestimate the available resources. They might think that underestimating what is available might bring more resources. Conversely, they might think that they will be held responsible for any deficiency identified which might lead them to overestimate what is available. It was difficult to know if response bias was a problem. In addition, interviewing small purposive sample of clinicians (16 medical directors) might not represent the whole population. However, it was used because the researcher aimed to collect informative and accurate answers on which is available and which is not. This is best achieved by asking only those clinicians who were designing, giving or administering the diabetes services. These clinicians are best placed to answer the research questions. It has been thought that asking patients or those clinicians who do not have experience or knowledge about diabetes care might be misleading. In addition, the aim was not to assess what the population think about the available resources but rather to assess what are

actually available. Therefore, using small purposive sample might be one of the best approaches to achieve this aim.

Collection and analysis of the available routine data was one of the methods used to assess diabetes care in this study. The availability of routine data on diabetes care was limited particularly for hospitals. Therefore, it was not possible to describe and assess all the components of diabetes care such as hospital admissions, waiting time for services and length of hospital stay. Moreover, routine data for some health determinants such as deprivation and socio-economic status were not available. In addition, the validity of the available routine data depends on the accuracy and completeness of coding and recording these data.[238] Although the Saudi MOH uses these data, its validity has not been assessed in published research.

Moreover, the validity of the data that were obtained from case note review depends also on the accuracy and completeness of the patients' records. The paper-based records of patients with diabetes in Saudi Arabia were reviewed by many researchers to assess some aspects of diabetes care.[138, 180, 256-258] However, these data have not been assessed for validity in published research. One of the limitations of the case note reviews is the assumption that absence of recorded results for a process measure means that the measure was not conducted. This might lead to underestimated measures due to missed recording.

Another limitation is lack of consistent recording of some data items among the PHCCs. This makes it unfeasible to assess patient compliance for example. Further, the case notes were reviewed by a team of nurses. Using different type of healthcare staff might result in different interpretations of the recorded care, which might in turn lead to variation in reporting the performance measures. Using clear, simple and easy-to-

answer questions with specific lists of answers, mostly yes or no, was a strategy used to overcome this limitation. In addition, the teams were trained on how to fill in the forms correctly and a sample of the completed forms were double checked and return to the nurses for correct and complete filling.

The third approach which involved interviewing samples of different stakeholders has some limitations. First, interviewing a systematic sample of patients who attended their appointment means that the views of local patients who did not access or were unable to access the healthcare services during the study period were not sought. This would also means that the views of those patients who are not compliant with attending their follow-up appointments were not sought. Therefore, the healthcare needs and problems of this type of patients might be under reported. Second, the majority of interviewed patients were male patients. This might lead to under reporting the healthcare needs and problems of female patients.

In addition, interviewing small purposive samples of healthcare professionals, managers and pharmacists might not represent the views of the more general population. However, they are presumed to have a broad experience and knowledge about the local diabetes care. Therefore, eliciting their views is the most appropriate method sensitive to local concerns and circumstances.[228, 284]

Moreover, taking notes instead of recording the interviews might involve interviewer's views and bias in writing the correct responses. Culturally, it gives the participants more willingness and freedom to express their views while recording the interviews

might lead the participants to be more reluctant and conservative. However, to minimize this bias, the participants were given the chance to review the notes taken and correct or change any responses.

### 9.3.3. *Strengths*

Despite these limitations, this study still provides valuable evaluation and information about one of the important chronic disease conditions in Saudi Arabia. Triangulation of the findings of each approach showed consistent results with other methods used.

Using all these approaches together in one study to assess diabetes care is one of the advantages of this study. This combination of approaches was used because first, the inherently complex nature of diabetes care which involves different professions, different aspects of care at different healthcare levels. Second, assessing the quality of care involves measuring different dimensions of quality such as structure, processes and outcomes of care and different areas of quality such as effectiveness, efficiency, acceptability, access, and equity of care.[192-193, 199] Third, the combination of approaches was used to help in achieving our research objectives and to assess as comprehensively as possible the diabetes care in Saudi Arabia. It was also considered that the use of only one approach, the research may suffer from associated limitations while using more than one approach would usefully supplement and extend the research findings and enhance confidence in them. Therefore, the consistency of findings across these approaches was a major strength of this study.

For example, when the routine data were checked (triangulated) against other sources of data in this thesis, they showed similar findings. The data on registered diabetes prevalence were similar to what has been reported by the structured questionnaire to

the medical directors and the case notes reviewed. Insufficient medications, staff, laboratory resources and health education resources were also reported or identified by most of the research methods used in this study. This would enhance the confidence in the findings of this thesis.

The other advantage of this study is the coverage of all the PHCCs and the diabetes centre in one city. This gives us a complete coverage of a typical city in Saudi Arabia. Many previous studies have had limited coverage. [138, 179, 246, 256-257, 269] Abha city is similar to most of the cities and large towns in Saudi Arabia in terms of population size, demographic characteristics and availability of healthcare and public services. However, Abha is different from the capital city and rural areas. The capital city is expected to have more, better and advanced healthcare services as well as public services. Conversely, the rural areas and remote villages are expected to have less healthcare and public services and the diabetes care is expected to be worse due to several difficulties such as lack of facilities, inadequate staff numbers, language barriers and rough roads.[302] Therefore, the findings of this study can be generalized to many cities and large towns but for rural areas and the capital city, this study might need to be replicated.

The private healthcare sector was not included in this study which might lead to missing those patients with good financial status. Although it is possible that they might receive better healthcare in the private clinics; but in the other hand, the outcomes of care might be not satisfactory because of other care issues such as lack of physical activity and unhealthy eating habits. The patients with diabetes who were attending a private hospital received more prescriptions for rosiglitazone, pioglitazone, ARBs, statins and aspirin than the patients in a governmental hospital. [108] However,

the targets of glycemic and blood pressure control were reported to be similar in both. Only the LDL-cholesterol control was achieved well among the private hospital patients due to the fact that 40% of them were treated with statins versus 29% of patients at the governmental hospital.[108]

### 9.3.4. *Implications for the interpretation of the findings*

The limitations of the data that were collected will influence the interpretation of the findings of this study, particularly in having precise estimates for the scale of the identified deficiencies. Thus, small deficiencies in diabetes care would be difficult to identify reliably. However, most of the identified deficiencies were large or very large which would strongly indicate that these deficiencies are real. This is unlikely to be due to bias unless it was of extreme form. In addition, the consistency of findings across the different methods used gives more confidence in the study findings.

## 9.4. Conclusion

Improving the structure and processes of diabetes care in Saudi Arabia is essential and urgent actions need to be taken. But this may not be enough to substantially improve the outcome indicators of diabetes care. In other words, the identified inadequacies of outcome indicators cannot be attributed only to the deficiencies and gaps in service provision. They resulted from complex and multidimensional interacting factors which related to the patients, the care providers, the healthcare system and the policy and organization of diabetes care. This study found that increasing intensity of diabetes therapy or receiving health education on more topics for example was not associated with improved glycemic control. Therefore, promoting patients' health-related behaviours such as patients' adherence to therapy prescribed, healthy eating and physical activity is also an essential part of good diabetes care.

Optimal diabetes services should be organized and delivered in a collaborative and coordinated way using effective and efficient integrated and systematic approaches with involvement of collaborative, well-trained and multidisciplinary teams. Achieving this is a huge challenge to the government in Saudi Arabia. All the identified barriers to service improvement should be tackled using effective interventions. This thesis recommends that the higher healthcare authorities in Saudi Arabia should start urgently with two national projects. The first one is a research project which aims to:

1. Replicate this study in Saudi Arabia at the national level,
2. Identify effective strategies to improve the quality of care in Saudi Arabia. For example:

- Test the Chronic Care Model (CCM) which has been shown to be an effective framework for improving the quality of diabetes care in some developed countries,[14, 303-304]
- Develop and test interventions appropriate to close the identified gaps in service provision and improve adherence to the recommended standards.

3. Identify the priorities for improving diabetes care through conducting a robust priority setting research project at the national level.
4. Identify effective strategies to prevent diabetes by controlling its risk factors and identifying high risk individuals for screening. This would include developing effective behavioural change interventions to promote healthy diet, physical activity and weight control.
5. Take into account the knowledge and experience of both the users and the providers of diabetes care when developing a research project or planning for service improvement.
6. Assess the cost-effectiveness of the current system of health care delivery and screening for diabetes and its complications.

The second project is a national diabetes care improvement programme which will aim, in light of the research project, to:

1. Develop all the required policy statements, guidelines, protocols, strategies and action plans for diabetes care,
2. Implement the required interventions to optimize diabetes care,

3. Coordinate, organize and facilitate the processes of changing and improving diabetes care,
4. Implement an audit programme for diabetes care,
5. Insure that the research findings are acted upon by maintaining high quality communication with the research project teams.

Diabetes mellitus has become an epidemic disease in Saudi Arabia. One in five Saudi Arabians beyond the age of 30 has diabetes mellitus. It is the third most common cause of visiting the primary healthcare centres and accounts for 6% of all deaths in the Kingdom. It currently imposes a large economic burden on the national healthcare system. Healthcare expenditure due to diabetes accounts for more than one fifth (21%) of the total national healthcare expenditure in Saudi Arabia. The percentage of the Saudi young population (< 45 years old) is almost 85% of the total population. The population is undergoing rapid demographic transition which will substantially increase the burden of diabetes if no action is taken to implement prevention programmes and improve the quality of diabetes care. The size of the diabetes problem, its burden, the quality of its care and where the deficiencies lie have been reported in this thesis. The views of patients, healthcare providers were explored. As a result, several recommendations were suggested and highly prioritized by a group of healthcare leaders in Abha city. These recommendations should be urgently considered and investigated for its applicability in improving diabetes care and reducing its burden. Further research is required and further actions are urgently needed.

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# Appendices

## Appendix 1: Prevalence studies of diabetes in Saudi Arabia, 1982-2012*

| Author, date | Participant characteristics | | | | | | | | | Diagnostic methods | | Diabetes prevalence (%) | | | IGT prevalence (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region (city) | Sampled population | Sampling strategy | Sample size (actual) | Urban | Rural | Male (%) | Female (%) | Age range | Screening method | Criteria | Overall | Male | Female | Overall | Male | Female |
| **Bacchus R. et al, 1982**[40] | Alriyadh region (Alkharj) | WP | NR | 1,385 | No | Yes | Yes (100%) | No | <15 - >65 | FBG or RBG/ OGTT | WHO 1980 | 2.5 | 2.5 | No | 0.2 | 0.2 | No |
| **Bell J. et al, 1984**[39] | Alriyadh region (Alkharj) | GP | NR | 1,513 | No | Yes | Yes (91.5%) | Yes (8.5%) | <15 - >65 | FBG or RBG/ OGTT | WHO 1980 | 2.64 | 2.45 | 4.7 | NR | NR | NR |
| **Fatani H. et al, 1985**[43] | Western region (Jeddah and Makkah) | ACH | Case series | 12,052 | Yes | No | Yes (53.1%) | Yes (46.9%) | 0 - >55 | RBG/ OGTT | WHO 1980 | 4.95 | 5.64 | 4.18 | 1.09 | 1.14 | 1.03 |
| **Fatani H. et al, 1987**[44] | Western region | GP | Cross-sectional | 5,222 | No | Yes | Yes (53.1%) | Yes (46.9%) | <15 - >55 | RBG/ OGTT | WHO 1980 | 4.3 | 2.9 | 5.9 | 1.1 | NR | NR |
| **El-Hazmi M. et al, 1989**[45] | Multiple regions | SP, ACH | Cross-sectional | 3,641 | Yes | Yes | Yes (63.4%) | Yes (36.6%) | <20 - >40 | FBG | ≥7.2 mmol/l (hyperglycaemia) | 7.9 | 8.45 | 7.05 | NR | NR | NR |
| **Anokute C., 1990**[46] | Alriyadh region (Riyadh) | SP | Cross-sectional | 3,158 | Yes | No | Yes (100%) | No | 15 - >50 | Urine/ FBG | WHO 1980 | 6 | 6 | No | NR | NR | NR |
| **Abu-Zeid H. et al, 1992**[47] | Aseer region (12 villages near Abha) | GP | Cross-sectional | 1,419 | Yes | Yes | Yes (50.6%) | Yes (49.4%) | >10 ->60 | 2-hours FPMCBG = 11.1 mmol/l / self-reported DM | Modified WHO 1985 | 4.6 | 5.5 | 3.6 | 3.7 | 2.5 | 4.9 |

* *See the list of abbreviations for appendices 1, 2 and 3 at the end of appendix 3.*

*Continue appendix 1:*

| Author, date | Participant characteristics | | | | | | | | | Diagnostic methods | | Diabetes prevalence (%) | | | IGT prevalence (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region (city) | Sampled population | Sampling strategy | Sample size (actual) | Urban | Rural | Male (%) | Female (%) | Age range | Screening method | Criteria | Overall | Male | Female | Overall | Male | Female |
| **Mahfouz A. et al, 1993**[73] | Aseer region | PHC | Cross-sectional | 238 PHCCs | Yes | Yes | Yes | Yes | 15 - >45 | RBG/ OGTT | WHO 1985 | 2.9 | NR | NR | NR | NR | NR |
| **El-Hazmi M. et al, 1995**[63] | National study | GP | Cross-sectional | 6,368 | Yes | Yes | Yes (45.5%) | Yes (54.5%) | 2 - 70 | FBG/ OGTT | WHO 1980/ 1985 | 5.2; (T1DM= 0.96, T2DM= 4.25) | 4.6; (T1DM= 0.93, T2DM= 3.69) | 5.7; (T1DM= 0.98, T2DM=4 .73) | 1.3 | 0.9 | 1.64 |
| **El-Hazmi M. et al, 1995**[64] | Alriyadh region (Riyadh) | GP | Cross-sectional | 3,981 | Yes | No | Yes (48%) | Yes (52%) | 3 - 70 | FBG/ OGTT | WHO 1980/ 1985 | 4.42 | 4.73 | 4.1 | 1.15 | 0.57 | 1.69 |
| **El-Hazmi M. et al, 1996**[66] | National study | GP | Cross-sectional | 23,493 | Yes | Yes | Yes (46.1%) | Yes (53.9%) | 2 - 70 | FBG/ OGTT | WHO 1980/ 1985 | 5.2 (T1DM= 0.22, T2DM= 4.99) | 5.7 (T1DM= 0.19, T2DM= 5.5) | 4.8 (T1DM= 0.237, T2DM= 4.556) | 0.715 | 0.5 | 0.9 |
| **El-Hazmi M. et al, 1996**[65] | Albaha region | GP | Cross-sectional | 2,060 | Yes | Yes | Yes (48.5%) | Yes (51.5%) | 2 - 70 | FBG/ OGTT | WHO 1980/ 1985 | 7.1 | 6 | 8.1 | 0.78 | 0.5 | 1.03 |
| **Al-Nuaim A., 1997**[32] | National study | GP | Cross-sectional | 13,177 | Yes (56.9 %) | Yes (43.1 %) | Yes (52%) | Yes (48%) | >15 | RBG/ OGTT + self-reported DM | WHO 1985 | 12.3 | (11.8%), Urban (12%), Rural (7%) | (12.8%), Urban (14%), Rural (7.7%) | 9.5 | (10%) Urban (10%), Rural (8%) | (9%) Urban (11%), Rural (8%) |

*Continue appendix 1:*

| Author, date | Participant characteristics | | | | | | | | | Diagnostic methods | | Diabetes prevalence (%) | | | IGT prevalence (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region (city) | Sampled population | Sampling strategy | Sample size (actual) | Urban | Rural | Male (%) | Female (%) | Age range | Screening method | Criteria | Overall | Male | Female | Overall | Male | Female |
| El-Hazmi M. et al, 1997[67] | Najran region | GP | Cross-sectional | 1,347 | Yes | Yes | Yes (44.2%) | Yes (55.8%) | 2 - 70 | FBG/ OGTT | WHO 1980/ 1985 | 3.04 | 3.35 | 2.39 | 0.59 | 0.67 | 0.53 |
| El-Hazmi M. et al, 1997[68] | Alqaseem region | GP | Cross-sectional | 2,694 | Yes | Yes | Yes (42.5%) | Yes (57.5%) | 3 - 70 | FBG/ OGTT | WHO 1980/ 1985 | 5.38 | 5.94 | 4.97 | 0.63 | 0.87 | 0.45 |
| El-Hazmi M. et al, 1998[69] | National study | GP | Cross-sectional | 25,337 | Yes | Yes | Yes (46.2%) | Yes (53.8%) | 2 - 77 | FBG/ OGTT | WHO 1980/ 1985 | 5.304, (T1DM= 0.27; T2DM= 5.04) | 5.86 (T1DM = 0.23 ; T2DM= 5.63) | 4.83 (T1DM= 0.30 ; T2DM= 4.53) | 0.62 | 0.5 | 0.72 |
| Warsy A. et al, 1999[70] | National study | GP | Cross-sectional | 14,660 | Yes | Yes | Yes (42%) | Yes (58%) | >14 - >60 | FBG/ OGTT | WHO 1980/ 1985 | NR | 9.7 (T1DM = 0.23 ; T2DM= 5.63) | 7 (T1DM= 0.30 ; T2DM= 4.53) | NR | 0.5 | 0.72 |
| El-Hazmi M. et al, 2000[71] | National study | GP | Cross-sectional | 14,660 | Yes | Yes | Yes (42%) | Yes (58%) | 14 -70 | FBG/ OGTT | WHO 1980/ 1985 | 9.7 (T2DM) | 11.5 (T2DM) | 8.3 (T2DM) | NR | NR | NR |
| Karim A. et al, 2000[74] | Alriyadh region (Alkharj) | ACH | Cross-sectional | 3,747 case notes | NR | NR | Yes (45%) | Yes (55%) | 0 ->75 | Case note reviews | NR | 4.1 | 2.55 | 5.32 | NR | NR | NR |

*Continue appendix 1:*

| Author, date | Participant characteristics | | | | | | | | | Diagnostic methods | | Diabetes prevalence (%) | | | IGT prevalence (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region (city) | Sampled population | Sampling strategy | Sample size (actual) | Urban | Rural | Male (%) | Female (%) | Age range | Screening method | Criteria | Overall | Male | Female | Overall | Male | Female |
| **Al-Nozha M., 2004**[83] | National study | GP | Cross-sectional | 16,917 | Yes | Yes | Yes (47.3%) | Yes (52%) | 30 - 70 | FBG | ADA 1997 | 23.7 | 26.2 | 21.5 | 14.1 | 14.4 | 13.9 |
| **MOH, WHO, EMRO, 2005**[84] | National study | GP | Cross-sectional | 4,652 | Yes | Yes | Yes (49.7%) | Yes (50.3%) | 15 - 64 | FBG | WHO | 15.3 | 15.8 | 14.9 | NR | NR | NR |
| **Al Osaimi S. et al, 2007**[85] | Alriyadh region (East of Riyadh city) | ACH | Case series | 451 (380) | Sub-urban (100%) | No | Yes (34.7%) | Yes (65.3%) | >18 | FBG | 1997 ADA | 15.8 | 24.2 | 11.3 | 7.3 | NR | NR |
| **Al-Baghli N. et al, 2010**[86] | Eastern region | GP | Cross-sectional | 197,681 | Yes | Yes | Yes | Yes | >30 | FBG/ RBG/ FPG | ADA 1997/ 2003 or history of DM | 17.2 | 15.9 | 18.6 | 2.7 | 2.2 | 3.2 |
| **Alqurashi K. et al, 2011**[88] | Western region (Jeddah) | ACH | Case series | 6,024 | Yes | No | Yes (37.8%) | Yes (62.2%) | 12 - >70 | Structured questionnaires | History of DM | 30 | 34.1 | 27.6 | NR | NR | NR |
| **Al-Daghri N. et al, 2011**[87] | Alriyadh region (Riyadh) | GP | Cross-sectional | 9,149 | Yes | No | Yes (58.6%) | Yes (41.4%) | 7 - 80 | FBG | WHO 1999 | 23.1 (T2DM); The age adjusted prevalence 31.6% (T2DM) | Age-adjusted prevalence = 34.7% | Age-adjusted prevalence = 28.6% | 9%; Age-adjusted prevalence = 10.2%. | NR | NR |
| **Al-Agha A. et al, 2012**[89] | Western region (Jeddah) | ACH (overweight & obese pediatric patients) | Case series | 387 | Yes | No | Yes (37%) | Yes (62%) | 2 - 18 | FBG/ RBG | ADA 2003 | 9.04 | NR | NR | NR | NR | NR |

## Appendix 2: Prevalence studies of Gestational Diabetes Mellitus in Saudi Arabia, 1982-2012

| Author, date | Participant characteristics | | | | | | | | | Diagnostic methods | | Diabetes prevalence (%) | | | IGT prevalence (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region (city) | Sampled population | Sampling strategy | Sample size (actual) | Urban | Rural | Male (%) | Female (%) | Age range | Screening method | Criteria | Overall | Male | Female | Overall | Male | Female |
| Al-Shawaf T. et al, 1988[54] | Alriyadh region (Riyadh) | ACH (PW) | Case series | 1,088 | Yes | No | No | Yes (100%) | 15 ->40 | FBG/ OGTT | WHO 1985 | 1.9 | No | 1.9 | 8.4 | No | 8.4 |
| Khwaja S. et al, 1989[56] | Eastern region (Alkhobar) | ACH (PW) | Case series | 455 | Yes | No | No | Yes (100%) | <20 - >40 | OGTT | Oats and Beischer, 1987/ WHO 1985 | 11 | No | 11 | 0.4 | No | 0.4 |
| Mesleh R. et al, 1990[60] | Alriyadh region (Riyadh) | ACH (PW) | Case series | 2,010 | Yes | No | No | Yes (100%) | 14 - 52 | OGTT | WHO 1985 | 0.6 | No | 0.6 | 2.9 | No | 2.9 |
| Ardawi M. et al, 2000[76] | Western region (Jeddah) | ACH (PW) | Case series | 1,056 (818) | NR | NR | No | Yes (100%) | NR | GCT/ OGTT | NDDG, 1979 | 12.5 | No | 12.5 | NR | NR | NR |
| Al-Rowaily M. et al, 2010[94] | Alryiadh region (Riyadh) | ACH (PW) | Case series | 770 (633) | Yes | No | No | Yes (100%) | <20 - >40 | FBG/ OGTT | WHO 1999/ ADA 2000 | WHO= 12.5; ADA= 3.8 | No | WHO= 12.5; ADA= 3.8 | NR | NR | NR |

## Appendix 3: Prevalence studies of T1DM in Saudi Arabia, 1982-2012

| Author, date | Participant characteristics | | | | | | | | | Diagnostic methods | | Diabetes Incidence (/100,000/year) | | | IGT prevalence (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region (city) | Sampled population | Sampling strategy | Sample size (actual) | Urban | Rural | Male (%) | Female (%) | Age range | Screening method | Criteria | Overall | Male | Female | Overall | Male | Female |
| **Kulaylat N. et al, 2000**[75] | Eastern region (Alhasa health centre) | SP (ARAMCO population) | Cross-sectional | NR | NR | NR | NR | NR | <15 | Reviewing different hospital data and reports | WHO DIAMOND Project Group, 1990 | 46 patients; Crude IR= 11.5; Age adjusted IR= 12.3 | 19 patients; Age adjusted IR= 9.9 | 27 patients; Age adjusted IR=14.8 | NR | NR | NR |
| **Al-Herbish A. et al, 2008**[90] | National study | GP | Cross-sectional | 45,682 | Yes (73%) | Yes (27%) | Yes | Yes | 0 - 19 | Questionnaire | History of T1DM | 0.109 (109.5/100, 000) | NR | NR | NR | NR | NR |
| **Abduljabbar M. et al, 2010**[91] | Eastern region (Dhahran) | SP (ARAMCO population) | Cross-sectional | 91,994 | Yes | No | NR | NR | <15Y | Reviewing pediatric diabetes registry | NR | 438; Average IR= 27.5 | 195 | 243 | NR | NR | NR |
| **Habeb A. et al, 2011**[92] | Almadenah region (Almadinah city) | GP | Cross-sectional | 2004 Saudi Arabia Population Census | Yes | No | NR | NR | 0 - 12 | History of T1DM | ISPAD consensus guidelines for the diagnosis of childhood diabetes | 419; mean annual IR= 27.6, mean annual age standardized IR= 29.0 | 170; mean annual IR= 22.2, mean annual age standardized IR= 23.0 | 249; mean annual IR= 33.0 , mean annual age standardized IR= 35.0 | NR | NR | NR |

*WP: working population, GP: general population, ACH: attendees of a clinic or hospital, SP: sub-population, PHC: primary healthcare registered population, PW: pregnant women. NR: not reported, FBG: fasting blood glucose, FPG: fasting plasma glucose, FPMCBG: fasting post meal capillary blood glucose, RBG: random blood glucose, OGTT: oral glucose tolerance test, GCT: glucose challenge test, IR: incidence rate. DM: diabetes mellitus, T1DM: type 1 diabetes mellitus, T2DM: type 2 diabetes mellitus, GDM: gestational diabetes mellitus, MODY: maturity onset diabetes of youth. WHO: world health organization, ADA: American diabetes association, NDDG: National Diabetes Data Group, ISPAD: International Society for Paediatric and Adolescent Diabetes.*

## Appendix 4: University of Dundee Research Ethics Committee approval

School of Psychology

**University of Dundee Research Ethics Committee**

Dr Abdullah Alshehri,
Department of Public Health,
School of Medicine,
University of Dundee,
Mackenzie Building,
Kirsty Semple Way,
Dundee DD2 4BF.

27 June 2011

Dear Dr Alshehri,

**Application Number: UREC 11046**

**Title: Diabetes needs assessment in Abha city, Saudi Arabia.**

Your application has been reviewed by the University Research Ethics Committee, and there are no ethical concerns with the proposed research. I am pleased to confirm that the above application has now been approved.

You submitted the following documents:

| | |
|---|---|
| 1. HNA protocol | 2. Informed consent form with Arabic |
| 3. Participant information sheet with Arabic | 4. Appendix 1 parts 1 - 4 |
| 5. Appendix 2 parts 1 – 3 | 6. Saudi MOH approval 1 – 3 |
| 7. UREC Application Form Version 1.10 | 8. Informed consent form with Arabic |
| 9. Participant information sheet with Arabic | |

Yours sincerely,

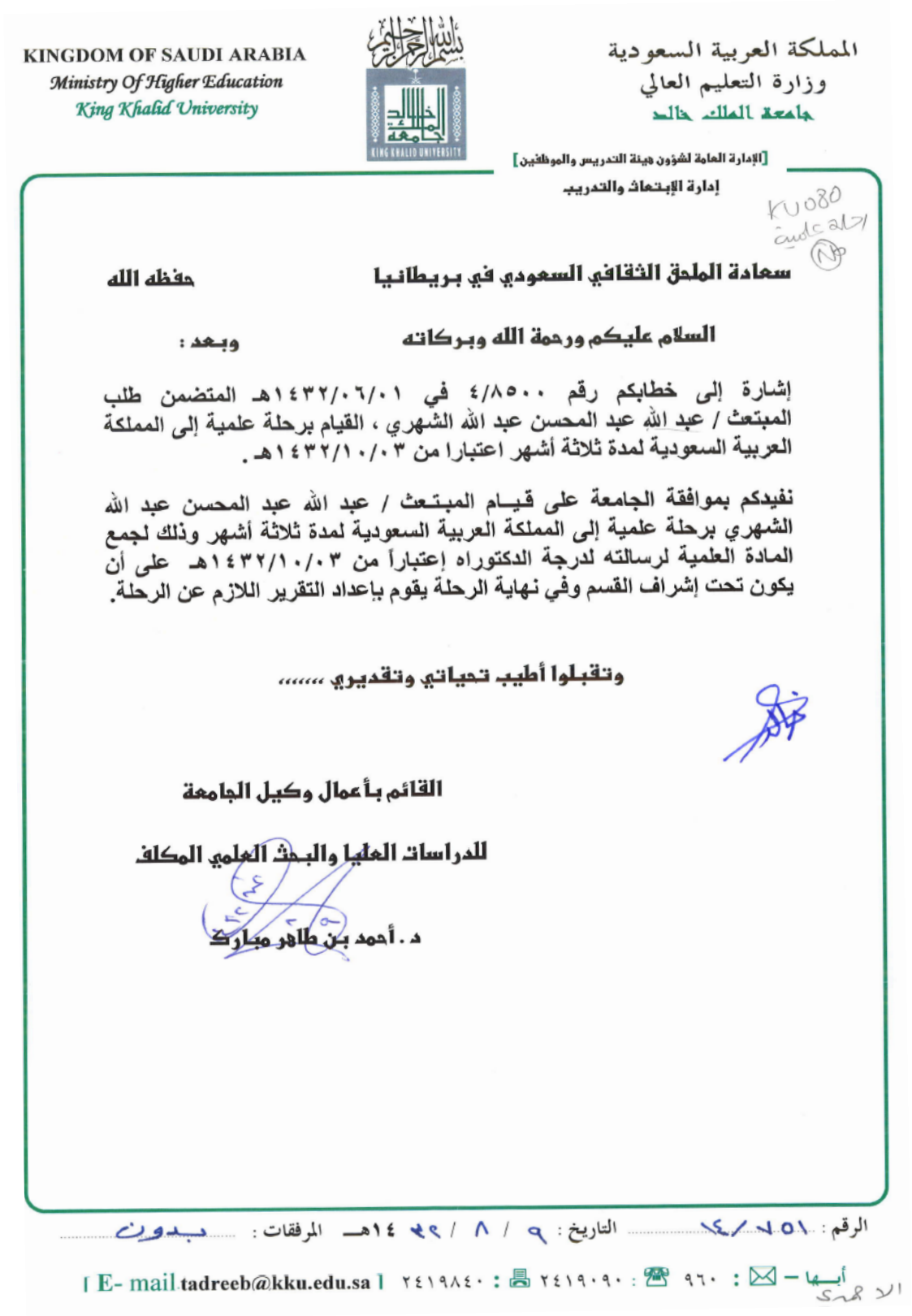
Peter Willatts

Digitally signed by Peter Willatts
DN: cn=Peter Willatts, c=GB, o=University of Dundee, ou=School of Psychology, email=p.willatts@dundee.ac.uk
Reason: I am the author of this document
Date: 2011.06.27 15:07:05 +01'00'

Dr Peter Willatts
Chair, University of Dundee Research Ethics Committee

College of Art and Social Sciences UNIVERSITY OF DUNDEE Dundee DD1 4HN Scotland UK
t +44(0)1382 384622/3 f +44 (0) 1382 229993 e h.henderson@dundee.ac.uk www.dundee.ac.uk/psychology

## Appendix 5: King Khalid University approval



KINGDOM OF SAUDI ARABIA
Ministry Of Higher Education
King Khalid University

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الملك خالد

[الإدارة العامة لشؤون هيئة التدريس والموظفين]
إدارة الإبتعاث والتدريب

KU080

سعادة الملحق الثقافي السعودي في بريطانيا حفظه الله

السلام عليكم ورحمة الله وبركاته وبعد :

إشارة إلى خطابكم رقم ٤/٨٥٠٠ في ١٤٣٢/٠٦/٠١هـ المتضمن طلب المبتعث / عبد الله عبد المحسن عبد الله الشهري ، القيام برحلة علمية إلى المملكة العربية السعودية لمدة ثلاثة أشهر اعتبارا من ١٤٣٢/١٠/٠٣هـ .

نفيدكم بموافقة الجامعة على قيام المبتعث / عبد الله عبد المحسن عبد الله الشهري برحلة علمية إلى المملكة العربية السعودية لمدة ثلاثة أشهر وذلك لجمع المادة العلمية لرسالته لدرجة الدكتوراه إعتباراً من ١٤٣٢/١٠/٠٣هـ على أن يكون تحت إشراف القسم وفي نهاية الرحلة يقوم بإعداد التقرير اللازم عن الرحلة.

وتقبلوا أطيب تحياتي وتقديري ،،،،،،

القائم بأعمال وكيل الجامعة
للدراسات العليا والبحث العلمي المكلف

د . أحمد بن طاهر مباركي

الرقم : ٤٥١ / ١٤ التاريخ : ٩ / ٨ / ١٤٣٢هـ المرفقات : بدون

[ E- mail tadreeb@kku.edu.sa ] ٢٤١٩٨٤٠ : ٢٤١٩٠٩٠ : ٩٦٠ : أبها –

## Appendix 6: Ministry of Health approval

المملكة العربية السعودية
وزارة الصحة
المديرية العامة للشئون الصحية بمنطقة عسير

وزارة الصحة
Ministry of Health

الرقم: .....
التاريخ: .....
المشفوعات: .....
الموضوع: .....

سعادة مدير إدارة مراكز الرعاية الصحية /

بوسط أبها – غرب أبها – شرق أبها المحترمين

السلام عليكم ورحمة الله وبركاته وبعد:-

طيه الاستدعاء المقدم من الباحث د/عبدالله بن عبد المحسن الشهري من جامعة الملك خالد لتحضير درجة الدكتوراه بطب الصحة العامة وحيث المقدم يتعلق بمرض السكري وكيفية علاجه ومكافحته ورغبته في القيام ببعض الأبحاث الطبية ودراسة وتقييم الاحتياجات الصحية لمرضى السكري بمدينة أبها ومقابلة مرضى السكري والأطباء والإداريين المختصين بمعالجة مرضى السكري بالمراكز الصحية وجمع بعض البيانات الصحية من ملفات السكري بالمراكز الصحية.

وبناء عليه لا مانع من التعاون مع المذكور وتقديم مايحتاج إليه من معلومات ،،،

ولكم أطيب تحياتي،،،،

مساعد المدير العام للرعاية الصحية والطب الوقائي

د/محمد بن حسين آل محيا

تليفون: ٢٢٤٦٢٤٢ - فاكس: ٢٢٤٦٢٤٠ - ص.ب: ٣٨٠٠

مطابع صحة عسير

## Appendix 7: Evaluation checklist for resources of mini-clinic at PHCCs

**MINISTRY OF HEALTH**

**DIRECTORATE GENERAL OF HEALTH AFFAIRS**

**PRIMARY HEALTH CARE AND PREVENTIVE MEDICINE DEPARTMENT**

**PROGRAM IMPLEMENTATION DEPARTMENT**

**ASEER REGION , KSA**

**EVALUATION CHECK-LIST FOR ORGANIZATION OF MINI-CLINIC FOR NON-COMMUNICALE CHRONIC DISEASES AT PHCC**

* **SECTOR :**

* **PHCC :**

**IMPORTANT FUNCTIONAL UNITS**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1** | **TYPE OF PHCC building :** | GOV. | **10*** | RENTED | **0** | DONATED | **0** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **2** | **MAN POWER: (≥ 1)** | | | | | |
| | F.M. Consult./Phys. | **5** | Male Nurse | **1** | Director | **1** |
| | Specialist | **5** | Female Nurse | **1** | H. Inspector | **1** |
| | Male GP | **1** | Lab. Technician | **1** | H. Educator | **1** |
| | Female GP | **1** | X-Ray Technician | **1** | Dental Assistant | **1** |
| | Dentist | **1** | Pharmacist | **1** | Nutritionist | **1** |
| | Social worker | **1** | | | | |

| **3** | **Other important functional units** | **AVAILABLE** (Priority score)* | **NOT AVAILABLE** |
|---|---|---|---|
| 1 | Waiting space. | **7** | **0** |
| 2 | Consultation room. | **10** | **0** |
| 3 | Room for the nurse. | **10** | **0** |
| 4 | Laboratory. | **10** | **0** |
| 5 | Health education room. | **7** | **0** |
| 6 | Pharmacy. | **10** | **0** |
| 7 | Dental clinic. | **8** | **0** |
| 8 | X-ray. | **5** | **0** |
| 9 | Ambulance. | **10** | **0** |
| 10 | Telephone. | **5** | **0** |

* *Bold red numbers represent the priority (importance) scores.*

| WAITING SPACE | | | |
|---|---|---|---|
| | | AVAILABLE | NOT AVAILABLE |
| 1 | Separate waiting space for male patients. | 4 | 0 |
| 2 | Separate waiting space for female patients. | 4 | 0 |
| 3 | One waiting space for all. | 4 | 0 |
| 4 | Health education materials (Leaflets, Posters, Video projection). | 5 | 0 |
| 5 | Health waste disposal container with black plastic bag. | 4 | 0 |
| 6 | Nearby toilet. | 5 | 0 |

| CONSULTATION ROOM | | | |
|---|---|---|---|
| | | AVAILABLE | NOT AVAILABLE |
| 1 | Stethoscope. | 1 | 0 |
| 2 | BP instrument. | 1 | 0 |
| 3 | Hammer. | 1 | 0 |
| 4 | Torch light. | 1 | 0 |
| 5 | Patient examination light with stand. | 1 | 0 |
| 6 | Ophthalmoscope. | 1 | 0 |
| 7 | ENT set. | 1 | 0 |
| 8 | Magnifying glass. | 1 | 0 |
| 9 | Tuning fork. | 1 | 0 |
| 10 | Monofilament. | 1 | 0 |
| 11 | PEF meter. | 1 | 0 |
| 12 | MDI. | 1 | 0 |
| 13 | Spacer (Adult and children). | 1 | 0 |
| 14 | Snellen's chart. | 1 | 0 |
| 15 | Working table for doctor. | 1 | 0 |
| 16 | Chair for doctor. | 1 | 0 |
| 17 | Chair or revolving stool for patient. | 1 | 0 |
| 18 | Chair for attendant. | 1 | 0 |
| 19 | Patient examination couch. | 1 | 0 |
| 20 | Foot step. | 1 | 0 |
| 21 | Screen. | 1 | 0 |
| 22 | Cabinet. | 1 | 0 |
| 23 | X-Ray illuminator. | 1 | 0 |
| 24 | White bed sheet. | 1 | 0 |
| 25 | Pillow. | 1 | 0 |

| | | | |
|---|---|---|---|
| 26 | Pillow cover. | 1 | 0 |
| 27 | Blanket. | 1 | 0 |
| 28 | Wall calenderer. | 1 | 0 |
| 29 | Desk calendar. | 1 | 0 |
| 30 | Bulletin board. | 1 | 0 |
| 31 | Board for statistics. | 1 | 0 |
| 32 | Board for memos and circular. | 1 | 0 |
| 33 | File for concerned circular. | 1 | 0 |
| 34 | Telephone. | 1 | 0 |
| 35 | Patient' register. | 1 | 0 |
| 36 | Prescription form. | 1 | 0 |
| 37 | Requisition form for laboratory investigation. | 1 | 0 |
| 38 | Requisition form for X-ray. | 1 | 0 |
| 39 | Referral sheet. | 1 | 0 |
| 40 | Annual evaluation sheet. | 1 | 0 |
| 41 | Data collection sheet. | 1 | 0 |
| 42 | Health education material (Life style management). | 1 | 0 |
| 43 | MOH protocol, guidelines and manuals for Hypertension, Diabetes and Bronchial asthma. | 1 | 0 |
| 44 | Guidelines for Hypertension, DM, Dyslipidemia and Health promotion from Joint program of Family medicine, Aseer. | 1 | 0 |
| 45 | Sample of medicines: Oral, parentral & inhaler (Hypertension, Diabetes and B. asthma). | 1 | 0 |
| 46 | Wash basin with running water. | 1 | 0 |
| 47 | Soap for hand washing. | 1 | 0 |
| 48 | Tissue papers. | 1 | 0 |
| 49 | Dispenser for antiseptic hand rub. | 1 | 0 |
| 50 | HC waste disposal container with black plastic bag. | 1 | 0 |
| 51 | HC waste disposal container with yellow plastic bag. | 1 | 0 |
| 52 | Visible signage (Mini-clinic for Chronic dis.). | 1 | 0 |

| NURSING ROOM | | | |
|---|---|---|---|
| | | AVAILABLE | NOT AVAILABLE |
| 1 | Working table for the nurse. | 1 | 0 |
| 2 | Chair for the nurse. | 1 | 0 |
| 3 | Revolving stool or chair for the patient. | 1 | 0 |
| 4 | Chair for the attendant. | 1 | 0 |
| 5 | Patient examination bed. | 1 | 0 |
| 6 | Foot step. | 1 | 0 |
| 7 | Screen. | 1 | 0 |

| | | | |
|---|---|---|---|
| 8 | Bed sheet. | 1 | 0 |
| 9 | Pillow. | 1 | 0 |
| 10 | Pillow cover. | 1 | 0 |
| 11 | Blanket. | 1 | 0 |
| 12 | Bulletin board. | 1 | 0 |
| 13 | Board for statistics. | 1 | 0 |
| 14 | Board for memos and remainder. | 1 | 0 |
| 15 | Standard weighing scale. | 1 | 0 |
| 16 | Standard Height measuring scale. | 1 | 0 |
| 17 | Patient examination light with stand. | 1 | 0 |
| 18 | Calculator. | 1 | 0 |
| 19 | Wall clock. | 1 | 0 |
| 20 | Wall Calendar with Hijri and Gregorian date. | 1 | 0 |
| 21 | Desk calendar with Hijri and Gregorian date. | 1 | 0 |
| 22 | Telephone with external line. | 1 | 0 |
| 23 | Computer with printer. | 1 | 0 |
| 24 | Instrument trolley having two shelves. | 1 | 0 |
| 25 | Stethoscope. | 1 | 0 |
| 26 | BP instrument. | 1 | 0 |
| 27 | Thermometer. | 1 | 0 |
| 28 | ECG machine with movable trolley. | 1 | 0 |
| 29 | Sufficient tracing papers for ECG. | 1 | 0 |
| 30 | ECG reporting form. | 1 | 0 |
| 31 | Glucometer with regular supply of Strip. | 1 | 0 |
| 32 | Filled oxygen cylinder. | 1 | 0 |
| 33 | Oxygen trolley. | 1 | 0 |
| 34 | I.V. Stand. | 1 | 0 |
| 35 | Suction machine. | 1 | 0 |
| 36 | Disposal oxygen masks. | 1 | 0 |
| 37 | Standard emergency drug list. | 1 | 0 |
| 38 | Standard emergency drugs. | 1 | 0 |
| 39 | Insulin syringes. | 1 | 0 |
| 40 | Disposables (Cotton, Sterile and non sterile gloves, alcohol strip, I/V infusion set etc.). | 1 | 0 |
| 41 | Containers for thermometer. | 1 | 0 |

| | | | |
|---|---|---|---|
| 42 | Containers for cotton, syringes, Alcohol strips | **1** | **0** |
| 43 | Shelf / cabinet for the Patient's m. record (File). | **1** | **0** |
| 44 | Cabinet for medical and non medical materials. | **1** | **0** |
| 45 | Snellen's chart. | **1** | **0** |
| 46 | Glucose drink. | **1** | **0** |
| 47 | Screening register Hypertension. | **1** | **0** |
| 48 | Screening register for Diabetes. | **1** | **0** |
| 49 | Screening register for Bronchial asthma. | **1** | **0** |
| 50 | Master book for hypertensive patient. | **1** | **0** |
| 51 | Master book for Diabetic patient. | **1** | **0** |
| 52 | Master book for Bronchial asthma patient. | **1** | **0** |
| 53 | Master book for other types of NCD. | **1** | **0** |
| 54 | Patient referrals register. | **1** | **0** |
| 55 | Patient ID card for Hypertensive patient. | **1** | **0** |
| 56 | Patient ID card for Diabetic patient. | **1** | **0** |
| 57 | Patient ID card for Bronchial asthma patient. | **1** | **0** |
| 58 | File and folder for patient. | **1** | **0** |
| 59 | Required Performa for patient's file. | **1** | **0** |
| 60 | Appointment card for patient. | **1** | **0** |
| 61 | Patient flow card (Serial number). | **1** | **0** |
| 62 | Case follow-up register for Hypertension. | **1** | **0** |
| 63 | Case follow-up register for Diabetes. | **1** | **0** |
| 64 | Case follow-up register for Obesity. | **1** | **0** |
| 65 | Case follow-up register for dyslipidemia. | **1** | **0** |
| 66 | Standard Performa of defaulters. | **1** | **0** |
| 67 | Appointment dairy. | **1** | **0** |
| 68 | Standard monthly data collection sheet. | **1** | **0** |
| 69 | Standard yearly data collection sheet. | **1** | **0** |
| 70 | File for circular in relation to Mini-clinic and non-communicable chronic disease activity. | **1** | **0** |
| 71 | File for important reference papers. | **1** | **0** |
| 72 | Health education material. | **1** | **0** |
| 73 | Posters displaying target groups for screening. | **1** | **0** |

| | | | |
|---|---|---|---|
| 74 | Washing basin with running water supply. | 1 | 0 |
| 75 | Hand washing soap. | 1 | 0 |
| 76 | Tissue papers. | 1 | 0 |
| 77 | H. waste disposal container with black plastic bags. | 1 | 0 |
| 78 | H. waste disposal container with yellow plastic bags. | 1 | 0 |
| 79 | Health waste disposal container for sharps. | 1 | 0 |
| 80 | Manual for DM, Hypertension, Bronchial asthma, obesity and dyslipidemia. | 1 | 0 |
| 81 | Policy & procedure for DM, Hypertension, Bronchial asthma, Obesity & Dyslipidemia. | 1 | 0 |
| 82 | Register for obesity. | 1 | 0 |
| 83 | Dispensers for antiseptic hand rub solution. | 1 | 0 |

| LABORATORY | | | | |
|---|---|---|---|---|
| **PHCC HAVING LABORATORY** | | | | |
| | | | **AVAILABLE** | **NOT AVAILABLE** |
| 1 | Haematology : | * CBC | 1 | 0 |
| | | * ESR | 1 | 0 |
| 2 | Biochemistry : | * Blood glucose ( Fasting , P.Prandial, Random & OGTT ) | 1 | 0 |
| | | * HA1C | 1 | 0 |
| | | * Renal Function Test | 1 | 0 |
| | | * Uric Acid | 1 | 0 |
| | | * Lipid Profile | 1 | 0 |
| | | * Calcium | 1 | 0 |
| | | * LFT | 1 | 0 |
| | | * Alb/Creatinine ratio | 1 | 0 |
| 3 | Urine | * Routine | 1 | 0 |
| | | * microscopic | 1 | 0 |
| **PHCC WITHOUT LABORATORY** | | | | |
| | | | **AVAILABLE** | **NOT AVAILABLE** |
| 1 | Glucometer for blood glucose | | 1 | 0 |
| 2 | Urine dipstick | | 1 | 0 |

| HEALTH PROMOTION/ HEALTH EDUCATION ROOM | | | |
|---|---|---|---|
| | | **AVAILABLE** | **NOT AVAILABLE** |
| 1 | Defined room. | **1** | **0** |
| 2 | Table for the health educator. | **1** | **0** |
| 3 | Chair for the health educator. | **1** | **0** |
| 4 | Chair for the patients (15-20 Chairs). | **1** | **0** |
| 5 | Shelf for health education material. | **1** | **0** |
| 6 | Health education materials for general and life style modification. | **1** | **0** |
| 7 | Cabinet. | **1** | **0** |
| 8 | Flip chart. | **1** | **0** |
| 9 | White board. | **1** | **0** |
| 10 | Pental pen for white board (Different colour). | **1** | **0** |
| 11 | Duster. | **1** | **0** |
| 12 | Projector. | **1** | **0** |
| 13 | Screen. | **1** | **0** |
| 14 | LCD/LED. | **1** | **0** |
| 15 | Health promotion register. | **1** | **0** |
| 16 | Health promotion record. | **1** | **0** |
| 17 | Health promotion file. | **1** | **0** |
| 18 | Diary for appointment, defaulter detection and follow-up for defaulter. | **1** | **0** |
| 19 | BMI chart. | **1** | **0** |
| 20 | Guideline for Health Promotion and periodic Health Maintenance in Family Practice. | **1** | **0** |
| 21 | Computer. | **1** | **0** |
| 22 | Health waste disposal container with black bag. | **1** | **0** |

| PHARMACY | | | |
|---|---|---|---|
| **a - Following drugs should be available according to MOH essential drug list for PHCC:** | | | |
| | | **AVAILABLE** | **NOT AVAILABLE** |
| 1 | Tab. Glibenclamide 5mg. | **1** | **0** |
| 2 | Tab. Metformin 500mg. | **1** | **0** |
| 3 | Tab. Gliclazide 80mg. | **1** | **0** |
| 4 | Insulin Human isophan Vial 100 units/1ml. | **1** | **0** |
| 5 | Insulin Human Regular Vail 100 units/1ml | **1** | **0** |
| 6 | Mixed Human Insulin Vail 100 units/1ml | **1** | **0** |
| 7 | Tab. Atenolol 100mg. | **1** | **0** |
| 8 | Tab. Captopril 25mg. | **1** | **0** |
| 9 | Tab. Enalapril maleate 10mg. | **1** | **0** |
| 10 | Tab. Linsinopril dehydrate 10mg. | **1** | **0** |
| 11 | Tab. Fosinopril 10mg. | **1** | **0** |
| 12 | Tab. Amlodipine besilate 5mg. or Felodepine 5mg. | **1** | **0** |
| 13 | Tab. Tab. Nitroglycerine 0.5mg. Sublingual. | **1** | **0** |
| 14 | Tab. Isosorbide Dinitrate 5mg Sublingual. | **1** | **0** |
| 15 | Tab. Isosorbide Dinitrate 20mg Sustained release. | **1** | **0** |
| 16 | Tab. Propranolol HCL 40mg. | **1** | **0** |
| 17 | Tab. Losartan 50mg. | **1** | **0** |
| 18 | Tab. Methyldopa 250mg. | **1** | **0** |
| 19 | Tab. Aspirin 75-100mg. | **1** | **0** |
| 20 | Tab. Simvastatin 10mg. | **1** | **0** |
| 21 | Tab. Pravastatin 20mg. | **1** | **0** |
| 22 | Tab. Atrovastatin 10mg. | **1** | **0** |
| 23 | Inj. Frusemide 20mg/2ml. Ampoule. | **1** | **0** |
| 24 | Tab. Frusemide 25mg. | **1** | **0** |
| 25 | Tab. Frusemide 40mg. | **1** | **0** |
| 26 | Tab. Hydroclorothiazide 25mg. | **1** | **0** |
| 27 | Inhaler Salbutamol 100 microgram. | **1** | **0** |
| 28 | Salbutamol Solution 0.5% for nebulizer. | **1** | **0** |
| 29 | Inhaler Beclomethazone 100 microgram. | **1** | **0** |
| 30 | Turbuhaler Budesonide 200 microgram. | **1** | **0** |
| 31 | Salmeterol xinafoate 25Mcg Inhaler / Fluticasone 125Mcg Evohaler. | **1** | **0** |
| 32 | Tab. Spironolactone 25mg. | **1** | **0** |

| b - Emergency Drugs: (Nurse room) | | | |
|---|---|---|---|
| | | **AVAILABLE** | **NOT AVAILABLE** |
| 1 | Inj. Frusemide 20mg. | **1** | **0** |
| 2 | Inhaler Salbutamol. | **1** | **0** |
| 3 | Salbutamol solution. | **1** | **0** |
| 4 | Inhaler Beclomethazone. | **1** | **0** |
| 5 | Tab. Atenolol 100mg. | **1** | **0** |
| 6 | Tab. Captopril 25mg. | **1** | **0** |
| 7 | Dextrose 50% 50ml. | **1** | **0** |
| 8 | Dextrose 5% 250ml. | **1** | **0** |
| 9 | Na Chloride 0.9% 500ml. | **1** | **0** |
| 10 | Dextrose 5%+Na chloride 0.9% 500ml. | **1** | **0** |
| 11 | Ringer lactate 500ml. | **1** | **0** |
| 12 | Inj. Human regular 100units/ml. | **1** | **0** |
| 13 | Inj. Adrenaline 1:1,000 | **1** | **0** |
| 14 | Inj. Calcium Chloride 10% 10ml syringe. | **1** | **0** |
| 15 | Inj. Sodium Bicarbonate 8.4% in 50ml. Vials. | **1** | **0** |
| 16 | Inj. Hydrocortisone 100mg/Vial. | **1** | **0** |
| 17 | Inj. Atropine sulphate 0.6mg/ampoule. | **1** | **0** |
| 18 | Inj. Antihistaminic. | **1** | **0** |
| 19 | Tab. Aspirine (Acetylsalicylic Acid) 500mg. | **1** | **0** |
| 20 | Inj. Morphin sulphate 10mg./ampoule. | **1** | **0** |
| 21 | Inj. Lidocain HCL 1% 100mg/vial. | **1** | **0** |
| 22 | Inj. Diazepam 10mg/ampoule. | **1** | **0** |
| 23 | Tab. Nitroglycerin 0.5mg Saublingual. | **1** | **0** |
| 24 | Tab. Isosorbide Dinitrate 20mg. Sublingual. | **1** | **0** |

Appendix 8: Service provision questionnaire for primary healthcare centres

Part 1

## Primary care data collection Form (A structured interview)

The data items will be collected from each primary healthcare centre (PHCC) by interviewing the technical supervisor of each PHCC.

### Indicators of process and structure

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| **1.** Is there a computer system in this centre? | ☐ Yes (1)<br>☐ No (2) | |
| **2.** Is there a diabetes mini-clinic? | ☐ Yes (1)<br>☐ No (2) | |
| **3.** Is there an appointment system for people with diabetes to be seen every 2-3 months? | ☐ Yes (1)<br>☐ No (2) | If yes, what is this system? |
| **4.** Is there a well-being clinic | ☐ Yes (1)<br>☐ No (2) | Health promotion clinic |
| **5.** Is there a trained physician for caring & educating patients with diabetes? | ☐ Yes (1)<br>☐ No (2) | |
| **6.** Is there a trained nurse for caring & educating patients with diabetes? | ☐ Yes (1)<br>☐ No (2) | |
| **7.** Is referral to hospital specialists available (referral system)? | ☐ Yes (1)<br>☐ No (2) | |
| **8.** Is there a guideline explaining in details the referral system? | ☐ Yes (1)<br>☐ No (2) | |
| **9.** Do you receive feedback from hospitals for each referred patient? | ☐ Yes (1)<br>☐ No (2) | |
| **10.** Is there a specific form for feedback? | ☐ Yes (1)<br>☐ No (2) | |
| **11.** Is there a system for identification of the records of diabetic patients? E.g tagging records or using a disease index. | ☐ Yes (1)<br>☐ No (2) | |
| **12.** Does each patient with diabetes have a diabetic records separated from the family records? | ☐ Yes (1)<br>☐ No (2) | |
| **13.** Is there a system for diabetes data collection? | ☐ Yes (1)<br>☐ No (2) | |
| **14.** Is there a computer programme and database for diabetes? | ☐ Yes (1)<br>☐ No (2) | |
| **15.** Is there a system for defaulter follow-up? | ☐ Yes (1)<br>☐ No (2) | |

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| **16.** Is there a treatment protocol you follow (Diabetes clinical practice guideline) for managing diabetes? | □ Yes (1)<br>□ No (2) | |
| **17.** Are there emergency protocols (e.g. hypoglycaemic attack, ketoacidosis) | □ Yes (1)<br>□ No (2) | |
| **18.** What are the routine investigations carried out for each diabetic patient follow-up visit? | □ Blood glucose test (1)<br>□ Urine dipstick test (2)<br>□ HbA1C (3)<br>□ Lipid profile (4) | □ Others , what? |
| **19.** How long is the routine follow-up period? | □ Every month (1)<br>□ Every 2 months (2)<br>□ Every 3 months (3)<br>□ Every 3-6 months (4) | Why you have chosen this period? |
| **20.** How is the annual routine referral organized for patients with diabetes? | | |
| **21.** How do you receive feedback from hospitals? | □ Direct from 2nd care (1)<br>□ By patients (2)<br>□ Other (3) | |
| **22. Do diabetic patients receive :** | | |
| • Education programme | □ Yes (1)<br>□ No (2) | If 'yes' when, how & for how long? |
| • Leaflets | □ Yes (1)<br>□ No (2) | |
| • Diabetic cards | □ Yes (1)<br>□ No (2) | |
| **23.** Do you provide services for patients with diabetes at home? | □ Yes (1)<br>□ No (2) | |
| **24. What services are provided for management of patients with complications?** | | |
| • Ischaemic heart disease | | |
| • Cerebrovascular disease | | |
| • Peripheral arterial disease | | |
| • Retinopathy | | |

| | | |
|---|---|---|
| • Nephropathy | | |
| • Neuropathy | | |
| **25. Do you deliver any of the following services for patients with diabetes in your centre:** | | |
| • A programme for tight control of blood glucose and blood pressure for diabetic patients. | □ Yes (1)<br>□ No (2) | |
| • Retinopathy screening for all diabetic patients. | □ Yes (1)<br>□ No (2) | |
| • Foot screening for those at high risk. | □ Yes (1)<br>□ No (2) | |
| • Screening obese people for IGT | □ Yes (1)<br>□ No (2) | |
| • Multiple risk factor management programmes. | □ Yes (1)<br>□ No (2) | |
| • A structured patient self-care education programme | □ Yes (1)<br>□ No (2) | |
| • Reduction of obesity and physical inactivity in high-risk groups | □ Yes (1)<br>□ No (2) | |
| **26.** What educational programmes and campaigns for diabetes have been carried out in last two years in your centre? | | |

## Workforce profile

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| **27.** What is the number of each of the following workers in your centre: | | |
| o Diabetologists | | |
| o Family physicians | | |
| o GPs | | |
| o Trained (diabetic ) nurses | | |
| o General nurses | | |
| o Dieticians | | |
| o Podiatrists | | |
| o Lab technicians | | |
| o Pharmacists | | |
| o Others | | |

## Lab facilities

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| **28.** What are the ways used to measure blood glucose level? | ☐ Laboratory facilities (1)<br>☐ Glucometer (2)<br>☐ Other (3) | |
| **29.** Is there access to the hospital laboratory for the following tests: | | |
| • Renal function | ☐ Yes (1)<br>☐ No (2) | |
| • Hb A1C | ☐ Yes (1)<br>☐ No (2) | |
| • Glomerular filtration rate (GFR) | ☐ Yes (1)<br>☐ No (2) | |
| • Lipids profile | ☐ Yes (1)<br>☐ No (2) | |

## PHCC's statistics

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| **30.** What is the total number of the registered population in this centre? | | |
| **31.** What is the total number of registered diabetic patients? (registered prevalence) | | |
| **32.** What is the total number of newly diagnosed and registered diabetic patients last year? (Incidence) | | |
| **33.** What is the average number of diabetic patients who are seen per day, month? | | |
| **34.** What is the default rate for the last six months? | | |

Appendix 9: Service provision questionnaire for secondary care

Part 2

# Secondary care data collection Form

This form is for collecting data from the secondary level of diabetes healthcare. The Diabetologists who are responsible about the management of diabetes in hospitals, diabetes centres will be interviewed to answer these questions.

## National & local strategies for tackling diabetes

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| 1.Is there a national service framework for managing diabetes? | □ Yes (1)<br>□ No (2) | |
| 2.Is there a national diabetes management guideline? | □ Yes (1)<br>□ No (2) | |
| 3.Is there a national strategy for tackling diabetes? | □ Yes (1)<br>□ No (2) | |
| 4.Is there a local managed clinical network for diabetes management? | □ Yes (1)<br>□ No (2) | |
| 5.Is there a local diabetes care pathway? | □ Yes (1)<br>□ No (2) | |
| 6.Is there a national dietary guideline? | □ Yes (1)<br>□ No (2) | |
| 7.Is there a national physical activity guideline? | □ Yes (1)<br>□ No (2) | |

## Local health burden

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| 8. How many diabetes related hospitalisations in last year? | | Number of patients admitted last year because of diabetes or one of its complications |
| 9. How many diabetes related emergency admissions? | | Number of patients visited the emergency department last year because of diabetes as a primary diagnosis or one of its complications |
| 10. How many amputation surgeries have been carried out in last year for patients with diabetes? | | |

## Indicators of structure

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| 11.Is there a computer system in this hospital/diabetes centre? | □ Yes (1)<br>□ No (2) | If yes, what they are used for? |
| 12.Is there a specific diabetes clinic? | □ Yes (1)<br>□ No (2) | |
| 13.Is there an appointment system for the people with diabetes to be seen routinely every 2-3 months? | □ Yes (1)<br>□ No (2) | |
| 14.What is the routine follow-up period? | □ Once a month (1)<br>□ Twice a month (2)<br>□ Three times a month (3)<br>□ Not applicable (4) | |
| 15.Is there a well-being clinic? | □ Yes (1)<br>□ No (2) | |
| 16.Is there a foot care clinic? | □ Yes (1)<br>□ No (2) | |
| 17.Is there a diabetes register? | □ Yes (1)<br>□ No (2) | |
| 18.Does each diabetic patient have a specific diabetes records? | □ Yes (1)<br>□ No (2) | |
| 19.Are there trained nurses for educating patients with diabetes? | □ Yes (1)<br>□ No (2) | |
| 20.Is referral to specialist's clinic available (referral system)? | □ Yes (1)<br>□ No (2) | |
| 21.Is there a guideline explaining in details the referral system? | □ Yes (1)<br>□ No (2) | |
| 22.Is there a specific form for referral to specialists? | □ Yes (1)<br>□ No (2) | |
| 23.Do you receive feedback from specialist's clinic for each referred patient? | □ Yes (1)<br>□ No (2) | |
| 24.Is there a specific form for feedback? | □ Yes (1)<br>□ No (2) | |
| 25.Is there a system for identification of the records of patients with diabetes? E.g tagging records or using a disease index. | □ Yes (1)<br>□ No (2) | |
| 26.Are education leaflets for patients with diabetes available? | □ Yes (1)<br>□ No (2) | |

| | | |
|---|---|---|
| 27.Are there diabetic identification cards available for patients in the hospital? | □ Yes (1)<br>□ No (2) | |
| 28.What are the anti-diabetic drugs available in your hospital? | Please list: | |
| 29.Is there a system for diabetes data collection? | □ Yes (1)<br>□ No (2) | |
| 30.Is there a computer programme and database for diabetes? | □ Yes (1)<br>□ No (2) | |
| 31.Is there a list for defaulters? | □ Yes (1)<br>□ No (2) | If yes, what are the procedures of recalling patient who default? |

## Workforce profile

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| 32. **What is the number of each of the following workers in your hospital:** | | |
| o Diabetologists | | |
| o Family physicians | | |
| o Trained (diabetic ) nurses | | |
| o General nurses | | |
| o Dieticians | | |
| o Podiatrists | | |
| o Lab technicians | | |
| o Pharmacists | | |
| o Others | | |

## Secondary care's statistics

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| 33. What is the total number of registered patients with diabetes? (registered prevalence) | | |
| 34. What is the total number of newly diagnosed and registered patients with diabetes in the last year? (Incidence) | | |
| 35. What is the average number of patients with diabetes who are seen per day, month? | | Estimate? |
| 36. What is the default rate for the last six months? (missed appointments) | | |

## Indicators of process

| Questions/data items | Answers | Sources/notes |
|---|---|---|
| 37. Is there a treatment protocol you follow (Diabetes clinical practice guideline) for managing diabetes? | □ Yes (1)<br>□ No (2) | |
| 38. Are there any emergency protocols for managing diabetes? (e.g. hypoglycaemic attack, ketoacidosis) | □ Yes (1)<br>□ No (2) | |
| 39. What are the routine investigations carried out for each diabetic patient's follow-up visit? | □ Blood glucose test (1)<br>□ Urine dipstick test (2)<br>□ HbA1C (3)<br>□ Lipid profile (4) | List any others: |
| 40. How long is the routine follow-up period? | □ Every month<br>□ Every 2 months<br>□ Every 3 months<br>□ Every 3-6 months | Why you have chosen this period? |
| 41. Do you have annual routine check-ups for patients with diabetes? | □ Yes (1)<br>□ No (2) | |
| 42. Is referral to specialist clinic available such as ophthalmologist, podiatrist? | □ Yes (1)<br>□ No (2) | |
| 43. How do you receive feedback from specialist clinics? | □ Direct from 2nd care (1)<br>□ By patients (2)<br>□ Other (3) | |
| 44. Do diabetic patients receive : | | |
| • Education programme | □ Yes (1)<br>□ No (2) | If 'yes' when , how & for how long? |
| • Leaflets | □ Yes (1)<br>□ No (2) | |
| • Diabetic cards | □ Yes (1)<br>□ No (2) | |
| 45. Do you provide services for diabetic patients at home? | □ Yes (1)<br>□ No (2) | |
| 46. What services are provided for management of patients with complications? | | |
| • Ischaemic heart disease | | |

| | | |
|---|---|---|
| • Cerebrovascular disease | | |
| • Peripheral arterial disease | | |
| • Retinopathy | | |
| • Nephropathy | | |
| • Neuropathy | | |
| 47. Do you deliver any of the following services for diabetic patients in your hospital: | | |
| • A programme for tight control of blood glucose and blood pressure for diabetic patients. | □ Yes (1)<br>□ No (2) | |
| • Retinopathy screening for all diabetic patients. | □ Yes (1)<br>□ No (2) | |
| • Foot screening for those at high risk. | □ Yes (1)<br>□ No (2) | |
| • Screening obese people for IGT | □ Yes (1)<br>□ No (2) | |
| • Multiple risk factor management programmes. | □ Yes (1)<br>□ No (2) | |
| • A structured patient self-care education programme | □ Yes (1)<br>□ No (2) | |
| • Reduction of obesity and physical inactivity in high-risk groups | □ Yes (1)<br>□ No (2) | |
| 48. What services are provided for pregnant women who either have pre-existing diabetes or have developed diabetes during pregnancy? | | |
| 49. What educational programmes and campaigns for diabetes have been carried out in last two years in your centre? | | |

Use the back of this page if you need more space

Appendix 10: Patient record data collection form, PHCC's version

Part 1.1

# Patient's record data collection Form

The data items will be collected from each diabetic patient's record at the (PHCCs).

## 1. Patient's data

| | Questions/data items | **Answers** | **Questions/data items** | **Answers** |
|---|---|---|---|---|
| A | PHC centre's name: | ..... | File No. :---------- | Today date: ----/----/1432 |
| | Date of birth or age: | dd/mm/yyyy | Nationality : | ☐ Saudi (1)<br>☐ Non Saudi (2) |
| | Gender: | ☐ Male (1)<br>☐ Female (2) | Date of diagnosis: (Date of registration) | dd/mm/yyyy |
| | Occupation: | ☐ Retired (1)<br>☐ Unemployed (2)<br>☐ Employed (3)<br>☐ Irregular work (4) | What is/was the main job? | ..... |
| | Education: | ☐ Illiterate (1)<br>☐ Read & write (2)<br>☐ Secondary school level or lower (3)<br>☐ University level (Bachelor) (4)<br>☐ Postgraduate level (master or higher) (5) | Smoking status:<br>☐ Smoker (1)<br>☐ X-smoker (2)<br>☐ Non-smoker (3) | |
| | Marital status: | ☐ Single (1)<br>☐ Married (2)<br>☐ Divorced (3)<br>☐ Widowed (4)<br>☐ Other (5) | What is the type of diabetes | ☐ Type 1 (1)<br>☐ Type 2 (2)<br>☐ Gestational DM (3)<br>☐ Other (4) |
| B | Last measured Height: ------- cm | | **BMI**:..... | Last **3** measured **FBS:**<br>(1): ----- (2):----- (3):----<br>(During last 12 months) |
| | Last 3 measured Weight :<br>(1): ---- (2):----- (3):---<br>(During last 12 months) | Last **3** measured **BP**:<br>(1): -------- (2):-------- (3):---------<br>(During last 12 months) | | |
| C | The patient is treated currently with: | ☐ Diet & exercise only (1)<br>☐ Metformin (2)<br>☐ Glibenclamide (3)<br>☐ Glicalazide (4)<br>☐ Insulin (5) | | ☐ Aspirin (6)<br>☐ ACE (7)<br>☐ Statin (8)<br>☐ ARBs (9)<br>☐ Others (10) |
| | Number of follow-up visits during the last 3 months | .....visits | Number of follow-up visits during the last **6** months | .....visits |
| | Is there an annual referral during the last 12 months: | ☐ Yes (1)<br>☐ No (2) | Is there a hospital feedback for the last annual referral | ☐ Yes (1)<br>☐ No (2) |
| | Date of the last annual referral: ----/----/------ | | Date of the last hospital feedback: ------/------/------- | |

| | | |
|---|---|---|
| | The last 3 recorded grades of patient's compliance. P-Poor F-Fair G-Good (During last 12 months) | Diet: (1): --------- (2):------- (3):-------<br>Exercise: (1): --------- (2):------- (3):-------<br>Appointment:(1): ---------(2):-------(3):-------<br>Drugs: (1): ------- (2):------- (3):------- |

## 2. Diabetic record's components

| Questions | Answers | Questions | Answers |
|---|---|---|---|
| Does the patient's record contain completed (filled in) sheet of the following: | | | |
| o Bio-data information sheet | ☐ Completed (1)<br>☐ Partly completed (2)<br>☐ Absent sheet (3) | o Complication (problem ) sheet | ☐ Completed (1)<br>☐ Partly completed (2)<br>☐ Absent sheet (3) |
| o Last annual referral checklist sheet<br>o **How many referral sheets? .....** | ☐ Completed (1)<br>☐ Partly completed (2)<br>☐ Absent sheet (3) | o Last Diabetes follow-up chart | ☐ Completed (1)<br>☐ Partly completed (2)<br>☐ Absent sheet (3) |
| o Last Feedback information from hospitals<br>o **How many feedbacks were received?.....** | ☐ Completed (1)<br>☐ Partly completed (2)<br>☐ Absent sheet (3) | o Education checklist sheet<br>▪ *Any date*<br>▪ *Any sheet* | ☐ Completed (1)<br>☐ Partly completed (2)<br>☐ Absent sheet (3) |

## 3. Diabetes complications/comorbidities

| Questions/data items | Answers | Notes |
|---|---|---|
| From the complication (problem) sheet or any other relevant papers, does the patient have any of the following complications: | | |
| • Hypertension | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Ischaemic heart disease | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Cerebrovascular disease | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Peripheral arterial disease | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Retinopathy | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Nephropathy | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Neuropathy | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Depression | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |
| • Foot problems or amputations | ☐ Yes (1)<br>☐ No (2) | If yes, when diagnosed mm/yyyy |

## 4. Education checklist

| Questions/data items | Answers | Notes |
|---|---|---|
| From the education checklist sheet, what are the items that have been explained for the patients? | | |
| 1.Explanation of diabetes | □ Yes (1)<br>□ No (2) | |
| 2. Diabetic card supplied | □ Yes (1)<br>□ No (2) | |
| 3. Explanation of anti-diabetic drugs:- | □ Yes (1)<br>□ No (2) | □ Equipment (1)<br>□ Technique (2)<br>□ Action (3)<br>□ Storage (4) |
| 4. Understanding hypoglycemia and other side effects. | □ Yes (1)<br>□ No (2) | |
| 5. Understanding diet | □ Yes (1)<br>□ No (2) | |
| 6. Seeking medical aid in illness (stress importance of never omitting insulin) | □ Yes (1)<br>□ No (2) | |
| 7. Urinalysis (All the patients should have urine dipsticks at home). | □ Yes (1)<br>□ No (2) | |
| 8. Care of feet | □ Yes (1)<br>□ No (2) | |
| 9. Risk of smoking | □ Yes (1)<br>□ No (2) | |
| 10. Exercise | □ Yes (1)<br>□ No (2) | |
| 11. Home blood glucose measurement technique (only if the patient has glucometer). Selected patients from Type 1 should be advised to buy a glucometer. | □ Yes (1)<br>□ No (2) | |
| 12. Patients' home monitoring chart | □ Yes (1)<br>□ No (2) | |
| 13. Special circumstances such as shift work, contraception, driving, travel, Glucagon and complications. | □ Yes (1)<br>□ No (2) | |

## 5. Annual screening for complications

| Questions/data items | Answers | Notes (If yes...) |
|---|---|---|
| From the most recent annual referral checklist sheet (hospital feedback), were the following examinations and investigations carried out and recorded? | | Date of the last annual referral checklist sheet (feedback): ...../...../..... |
| Blood pressure | ☐ Yes (1)<br>☐ No (2) | What was the reading of BP: ------/------ |
| Cardiovascular system examination | ☐ Yes (1)<br>☐ No (2) | ☐ Normal (1)<br>☐ Abnormal (2) |
| Neuro-examination including (sensory, motor and reflexes) | ☐ Yes (all) (1)<br>☐ Yes (some) (2)<br>☐ No (all) (3) | ☐ Normal (1)<br>☐ Abnormal (2) |
| Eye examination including (visual acuity, cataract, fundus examination) | ☐ Yes (all) (1)<br>☐ Yes (some) (2)<br>☐ No (all) (3) | ☐ Normal (1)<br>☐ Abnormal (2) |
| Foot examination including pulses | ☐ Yes (all) (1)<br>☐ Yes (some) (2)<br>☐ No (all) (3) | ☐ Normal (1)<br>☐ Abnormal (2) |
| Injection sites examination | ☐ Yes (1)<br>☐ No (2) | ☐ Normal (1)<br>☐ Abnormal (2) |
| Smoking status | ☐ Yes (1)<br>☐ No (2) | |
| HbA1C | ☐ Yes (1)<br>☐ No (2) | What was the reading of HbA1C: -------- |
| Creatinine | ☐ Yes (1)<br>☐ No (2) | What was the reading of: Creatinine: ----------- |
| Cholesterol | ☐ Yes (1)<br>☐ No (2) | What was the reading of: Cholesterol: ---------- |
| Triglycerides | ☐ Yes (1)<br>☐ No (2) | What was the reading of: Triglycerides: --------- |
| Urine dipstick | ☐ Yes (1)<br>☐ No (2) | If yes, what was the reading of: Urine dipstick: ---------- |
| 24 hours urine protein | ☐ Yes (1)<br>☐ No (2) | What was the reading of: Proteinuria:---------- |
| Chest x-ray | ☐ Yes (1)<br>☐ No (2) | ☐ Normal (1)<br>☐ Abnormal (2) |
| ECG | ☐ Yes (1)<br>☐ No (2) | ☐ Normal (1)<br>☐ Abnormal (2) |
| Blood glucose | ☐ Yes (1)<br>☐ No (2) | If yes, what was the reading of:<br>FBS:------ RBS:------- |
| Other! | ☐ Yes (1)<br>☐ No (2) | Other recorded tests but not mentioned here! |

Appendix 11: Patient record data collection form, ADC version

Part 1.2

# Patient's record data collection Form

The data items will be collected from each diabetic patient's record at the (Diabetes centre).

## 1. Patient's data

| Questions/data items | Answers | Questions/data items | Answers |
|---|---|---|---|
| **Centre's name:** | ..... | **File No**. :---------- | Today date: ----/----/1432 |
| **Date of birth or age:** | dd/mm/yyyy | **Nationality** : | ☐ Saudi (1)<br>☐ Non Saudi (2) |
| **Gender**: | ☐ Male (1)<br>☐ Female (2) | **Date of registration**: dd/mm/yyyy | **Date of diagnosis:** dd/mm/yyyy |
| **Occupation**: | ☐ Retired (1)<br>☐ Unemployed (2)<br>☐ Employed (3)<br>☐ Irregular work (4)<br>☐ Student (5) | What is/was the main job? ..... ..... | Referred from: ..... ..... |
| **The patient is treated currently with:** | ☐ Diet & exercise only (1)<br>☐ Metformin (2)<br>☐ Glibenclamide (3)<br>☐ Glicalazide (4)<br>☐ Insulin (5) | ☐ Aspirin (6) ☐ Others (11)<br>☐ ACE (7)<br>☐ Statin (8)<br>☐ ARBs (9)<br>☐ Insulin pump (10) | |
| **Past Medical Hx:**<br>☐ HPN(1)<br>☐ IHD(2)<br>☐ MI(3)<br>☐ Obesity(4)<br>☐ CVA(5)<br>☐ Dyslipidaemia(6)<br>☐ PVD(7)<br>☐ DKA(8)<br>☐ Uncontrolled DM(9)<br>☐ Hypoglycemia(10) | **Smoking status:**<br>☐ Smoker (1)<br>☐ X-smoker (2)<br>☐ Non-smoker (3) | **What is the type of diabetes:**<br>☐ Type 1 (1)<br>☐ Type 2 (2)<br>☐ Gestational DM (3)<br>☐ Other (4) | Last **3** measured **FBS:**<br>(1): -------<br>(2):--------<br>(3):--------<br>(During last 12 months) |
| Last measured **Height:** ---------- **cm** | **BMI:**..... | **Injection site:**<br>☐ Normal(1)<br>☐ Hypertrophy(2)<br>☐ Atrophy(3) | |
| Last **3** measured **Weight :**<br>(1): --------- (2):---------- (3):---------<br>(During last 12 months) | Last **3** measured **BP:**<br>(1): -------- (2):-------- (3):--------<br>(During last 12 months) | | |
| Number of **follow-up visits** during the last **3** months | .....visits | Number of **follow-up visits** during the last **6** months | .....visits |
| Number of **follow-up visits** during the last **12** months | .....visits | | |

## 2. Diabetic record's components

| Questions | Answers | Questions | Answers |
|---|---|---|---|
| Does the patient's record contain (filled in) sheet of the following: | | | |
| **bio-data information sheet (patient's record)** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) | **Complication (problem ) sheet** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) |
| **Progress note form** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) | **Last Diabetes follow-up sheet** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) |
| **Diabetic eye file**<br>All 3 sheets | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) | **Diabetes Education programme**<br>***Any date***<br>***Any sheet*** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) |
| **Diabetic foot registry** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) | **Diabetic foot clinic progress sheet** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) |
| **Nursing diabetic assessment** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) | **Diet plan assessment** | □ Completed (1)<br>□ Partly completed (2)<br>□ Absent sheet (3) |

## 3. Diabetes complications/comorbidities

| Questions/data items | Answers | Notes |
|---|---|---|
| From the complication (problem) sheet or any other relevant papers, does the patient have any of the following complications: | | |
| • Hypertension (HTN) | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Ischaemic heart disease (IHD) | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Cerebrovascular disease (CVA) | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Peripheral arterial disease | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Retinopathy | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Nephropathy | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Neuropathy | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Depression | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Foot problems or amputations | □ Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |

| | | |
|---|---|---|
| • MI | □Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Dyslipidaemia | □Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |
| • Obesity | □Yes (1)<br>□ No (2) | If yes, when diagnosed<br>mm/yyyy |

## 4. Education checklist

| **Questions/data items** | **Answers** | **Notes** |
|---|---|---|
| From the education checklist sheet, what are the items that have been explained for the patients? | | |
| 1.What is diabetes? | □ Yes (1)<br>□ No (2) | |
| 2.How to prevent & treat symptoms of hypoglycaemia & hyperglycemia | □ Yes (1)<br>□ No (2) | |
| 3.Diabetic card supplied (available) | □ Yes (1)<br>□ No (2) | |
| 4.Explanation of what is insulin? | □ Yes (1)<br>□ No (2) | |
| 5.Diet explanation (Understanding diet) | □ Yes (1)<br>□ No (2) | |
| 6.Exercise | □ Yes (1)<br>□ No (2) | |
| 7.Explanation of oral hypoglycaemic (anti-diabetic drugs):- | □ Yes (1)<br>□ No (2) | |
| 8.Self monitoring | □ Yes (1)<br>□ No (2) | |
| 9.Special issues & circumstances such as Ramadan, hajj, parties, travelling.. | □ Yes (1)<br>□ No (2) | |
| 10. Complications | □ Yes (1)<br>□ No (2) | |
| 11. Bad habits (behaviours) smoking, overeating.. | □ Yes (1)<br>□ No (2) | |
| 12. Hygiene: foot care, eye care, other hygiene | □ Yes (1)<br>□ No (2) | |

## 5. Annual screening for complications

| Questions/data items | Answers | Notes (If yes...) |
|---|---|---|
| From the last patient's records or (progress notes of the last visit), were the following examinations and investigations carried out and recorded? | | Date of the last visit:...../...../..... |
| Blood pressure | □ Yes (1)<br>□ No (2) | What was the reading of BP: ------/------ |
| Cardiovascular system examination | □ Yes (1)<br>□ No (2) | □ Normal (1)<br>□ Abnormal (2) |
| Neuro-examination including (sensory, motor and reflexes) | □ Yes (all) (1)<br>□ Yes (some) (2)<br>□ No (all) (3) | □ Normal (1)<br>□ Abnormal (2) |
| Eye examination including (visual acuity, cataract, fundus examination) | □ Yes (all) (1)<br>□ Yes (some) (2)<br>□ No (all) (3) | □ Normal (1)<br>□ Abnormal (2) |
| Foot examination including pulses | □ Yes (all) (1)<br>□ Yes (some) (2)<br>□ No (all) (3) | □ Normal (1)<br>□ Abnormal (2) |
| Injection sites examination | □ Yes (1)<br>□ No (2) | □ Normal (1)<br>□ Abnormal (2) |
| Smoking status | □ Yes (1)<br>□ No (2) | |
| HbA1C | □ Yes (1)<br>□ No (2) | What was the reading of HbA1C: ------- |
| Creatinine | □ Yes (1)<br>□ No (2) | What was the reading of: Creatinine: ---------- |
| Cholesterol | □ Yes (1)<br>□ No (2) | What was the reading of:<br>Cholesterol: ---------- |
| Triglycerides | □ Yes (1)<br>□ No (2) | What was the reading of: Triglycerides: ---------- |
| Urine dipstick | □ Yes (1)<br>□ No (2) | If yes, what was the reading of: Urine dipstick: ---------- |
| 24 hours urine protein | □ Yes (1)<br>□ No (2) | What was the reading of:<br>Proteinuria:---------- |
| Chest x-ray | □ Yes (1)<br>□ No (2) | □ Normal (1)<br>□ Abnormal (2) |
| ECG | □ Yes (1)<br>□ No (2) | □ Normal (1)<br>□ Abnormal (2) |
| Blood glucose | □ Yes (1)<br>□ No (2) | If yes, what was the reading of:<br>FBS:------ RBS:------- |
| Other! | □ Yes (1)<br>□ No (2) | Other recorded tests but not mentioned here! |

## Appendix 12: Semi-structured interview schedule for patients with diabetes

Part 1

# Semi-structured interview schedule for patients with diabetes

أريد أن أتحدث إليك عن الاحتياجات الصحية للأشخاص الذين يعانون من مرض السكري وعن خدمات الرعاية الصحية في مدينة أبها. أنا مهتم في التصدي لمشكلة داء السكري في المملكة العربية السعودية و كيفية تحسين الرعاية الصحية للأشخاص الذين يعانون من مرض السكري. أريد أن أسمع عن أي أفكار لديك والتي من شأنها أن تجعل صحة مرضى السكري على نحو أفضل. يهدف هذا اللقاء للبحث في دورك الخاص في تحسين خدمات الرعاية الصحية لدينا وكيف تستشعر إمكانية تغيير الخدمات الصحية لتلبي بطريقة أفضل إحتياجات الأشخاص الذين يعانون من مرض السكري. يرجى إعطاء أكبر قدر من المعلومات.

Warm up questions

1. **How did you find out you have diabetes?**

**كيف اكتشفت أو عرفت أنك مصاب بالسكري؟**

- ☐ **(1) By chance بالصدفة**
- ☐ **(2) By diabetes symptoms من خلال أعراض السكري**
- ☐ **(3) By screening بواسطة التشخيص المبكر**
- ☐ **(4) By diabetes complications بسبب ظهور مضاعفات السكري**
- ☐ **(5) Other? Specify أخرى حدد .....**

2. **At the time of diagnosis, did you have any diabetes complications? ☐ Yes ☐ No**

**عندما أكد الأطباء أنك مصاب بالسكري هل كنت تعاني من أي مضاعفات للسكري؟**

**☐ نعم ☐لا**

Perception of health needs

| 3. What are the health needs that you currently need but have not been currently met for you?<br>ما هي الاحتياجات الصحية التي تحتاجها حالياً لكن لم يتم توفيرها لك؟ | 4. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five needs for your health? (in terms of urgency, the seriousness of the need that the intervention may resolve)<br>هل ممكن أن تتفضل وتقوم بترتيب هذه الاحتياجات بدأً بأهم احتياج ينبغي إعطاؤها الأولوية والاهتمام بالنسبة لصحتك ثم الذي يليه وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم الاحتياج , هل هو طارئ, مدى خطورته وتأثيره , هل يوجد حلول مناسبة له .... | 5. From your point of view, what solutions could be implemented to meet these needs?<br>من وجهة نظرك: ما هي الحلول التي يمكن أن تنفذ لسد هذه الاحتياجات؟ | 6. What are the differences these solutions will make?<br>ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟ |
|---|---|---|---|
| **Health Needs** | Need Priority أولوية الاحتياج | Solutions الحلول | Difference made الفرق والتأثير |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

Perception of healthcare needs

| 7. **What problems (difficulties) have you encountered during the management of your diabetes in the** primary healthcare centre?<br><br>**ما هي المشاكل (الصعوبات) التي واجهتها أثناء متابعتك لمرض السكري** بمركز الرعاية الصحية الأولية؟ | 8. **Could you please rank from 1-5 (1 being the highest priority) what you think are the top five healthcare problems affecting your diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)**<br><br>**هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري لديك بدأ بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها ....** | 9. **From your point of view, what solutions are needed for these problems?**<br><br>**ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟** | 10. **What are the differences these solutions will make?**<br><br>**ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟** |
|---|---|---|---|
| **Healthcare (problems)** | Problem Priority أولوية المشاكل | Solutions الحلول | Difference made التأثير والفرق |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

| 11. **What problems (difficulties) have you encountered during the management of your diabetes in the** hospitals & diabetes centres**?**<br>**ما هي المشاكل (الصعوبات) التي واجهتها أثناء متابعتك لمرض السكري** بالمستشفيات ومراكز السكري**؟** | 12. **Could you please rank from 1-5 (1 being the highest priority) what you think are the top five of these healthcare problems (difficulties) affecting your diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)**<br>**هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري لديك بدأ بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها ....** | 13. **From your point of view, what solutions are needed for these problems?**<br>**ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟** | 14. **What are the differences these solutions will make?**<br>**ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟** |
|---|---|---|---|
| **Healthcare (problems) الصعوبات** | Problem Priority أولوية المشاكل | Solutions الحلول | Difference made التأثير والفرق |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

Perception of diabetes healthcare services

15. **What are the other primary healthcare services you think people with diabetes need to be available in each primary health care centre and currently are not available in your primary health care centre? E.g making appointment system, specific lab facilities, specific drugs, specific clinics...**

**ما هي الخدمات الصحية الأولية التي تعتقد أن مرضى السكر يحتاجون توفرها في كل مركز صحي وهي غير متوفرة حالياً في مركزك الصحي؟ مثلا نظام مواعيد، خدمات مختبرية معينة، أدوية معينة، برامج معينة...**

1.....

2.....

3.....

4.....

5.....

16. **What are the current primary healthcare services you think needs to be improved or changed? What are your suggestions to improve these services? E.g making appointment system, mini-clinics for diabetes, more clinics for dietician or podiatrists ...**

**ما هي الخدمات الصحية الأولية المتوفرة حالياً وتعتقد انها تحتاج تطوير أو تغيير؟ وما هو نوع التطوير او التغيير الذي تقترحه؟ مثلا خدمات مخبرية معينة، أدوية معينة، عيادات متخصصة مع اخصائي تغذية أو اخصائي قدم..**

| **الخدمات** **Services** | نوع التطوير أو التغيير Needed improvements |
|---|---|
| | |
| | |
| | |
| | |

| 17. **From your perspective, what are the barriers of improving health care for people with diabetes?**<br>**من وجهة نظرك ما هي عوائق تطوير الرعاية الصحية لمرضى السكري؟** |
|---|
| 1.<br>2.<br>3.<br>4.<br>.5 |



Patient's demographic details

| Questions/data items | Answers | Questions/data items | Answers |
|---|---|---|---|
| **Healthcare centre's name:**<br>**……** | □ Primary level (1)<br>□ Secondary level (2) | Gender: | □ Male (1)<br>□ Female (2) |
| **Do you have a diabetes identification card?** | □ (1) Yes if yes → □ Completed (3)<br>□ Partly completed (4)<br>□ (2) No | Nationality : | □ Saudi (1)<br>□ Non Saudi (2) |
| **Age or date of birth:**<br>**……/……/……** | □ (1) Youths (aged 15 – 24)<br>□ (2) Adults (aged 25 – 44)<br>□ (3) Middle aged (aged 45 – 64)<br>□ (4) Older People (aged 65+) | Occupation:<br>What is/was your main job?<br>…… | □ Retired (1)<br>□ Unemployed (2)<br>□ Employed (3)<br>□ Irregular work (4) |

| | | | |
|---|---|---|---|
| **Education:** | □ Illiterate (1)<br>□ Read & write (2)<br>□ Secondary school level or lower (3)<br>□ University level (Bachelor) (4)<br>□ Postgraduate level (master or higher) (5) | When first diagnosed (date) or<br>...../...../.....<br>How long have you had diabetes? | Smoking status:<br>□ Smoker (1)<br>□ X-smoker (2)<br>□ Non-smoker (3) |
| **What is the type of diabetes you have?** | □ Type 1 (1)<br>□ Type 2 (2)<br>□ Gestational DM (3)<br>□ Other! Specify..... (4) | What is the type of treatment you are currently on: | □ Diet & exercise only (1)<br>□ Oral anti-diabetic drugs (2)<br>□ Insulin (3)<br>➢ Who prepares syringe? .....<br>➢ Who administers insulin?..... |
| **Type of accommodation:**<br>□ Owned (4)<br>□ Rented (5) | □ Old traditional house (1)<br>□ Modern house (2)<br>□ Flat (3) | Do you suffer from any of the following? Check all that apply:<br>□ Ischemic heart disease (1)<br>□ Cerebrovascular disease (2)<br>□ Peripheral arterial disease (3)<br>□ Retinopathy (4) | □ Nephropathy (5)<br>□ Neuropathy (6)<br>□ Depression (7)<br>□ Foot problems or amputations (8) |
| **Are you Living alone?** | □ Yes (1)<br>□ With my wife/husband only (2)<br>□ With my wife/husband & children(3)<br>□ With my Family including children (4)<br>□ With my Family as a child (5)<br>□ With my brother & his family (6)<br>□ With my sons and their families (7) | Do you have a glucometer? | □ Yes (1)<br>□ No (2) |

- Check up the notes taken with the patient, check up after you have written the notes: 'What I have written down is… Have I noted that down OK, or do you want to change something?
- Allows the interviewee to (re)consider what has been said while you write and expand the answers

Part 2

# Semi-structured interview schedule for Healthcare professionals

## Preamble

أريد أن أتحدث إليك عن الاحتياجات الصحية للأشخاص الذين يعانون من مرض السكري وعن خدمات الرعاية الصحية في مدينة أبها. أنا مهتم في التصدي لمشكلة داء السكري في المملكة العربية السعودية و كيفية تحسين الرعاية الصحية للأشخاص الذين يعانون من مرض السكري. أريد أن أسمع عن أي أفكار لديك والتي من شأنها أن تجعل صحة مرضى السكري على نحو أفضل. يهدف هذا اللقاء للبحث في دورك الخاص في تحسين خدمات الرعاية الصحية لدينا وكيف تستشعر إمكانية تغيير الخدمات الصحية لتلبي بطريقة أفضل إحتياجات الأشخاص الذين يعانون من مرض السكري. يرجى إعطاء أكبر قدر من المعلومات.

## Warm up question

**1. What is your role and responsibilities in providing healthcare to people with diabetes? Do you think roles and responsibilities need to be specified and organized? □ Yes □ No**

**ما هو دورك ومسؤولياتك في تقديم الرعاية الصحية لمرضى السكري؟ هل تعتقد أن الأدوار والمسؤوليات تحتاج لتحديد وتنظيم؟ □ نعم □لا**

| | |
|---|---|
| □ دور وقائي Preventive role | □ دور تأهيلي Rehabilitation role |
| □ دور إداري Administration role | □ دور تثقيفي Education role |
| □ دور علاجي Treating role | □ أخرى Other? |
| □ دور عناية Caring role | |

## Perception of national health problems

**2. What are the most prevalent health problems? Which problems have most impact on health at the national level?**

**ماهي المشاكل الصحية الاكثر انتشاراً و الاكثر تأثيراً على الصحة على المستوى الوطني ؟**

## Perception of health needs

| 3. What are the health needs that have not been currently met for patients with diabetes?<br>ما هي الاحتياجات الصحية التي لم يتم حالياً تغطيتها أو توفيرها لمرضى السكري؟ | 4. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five needs for health of people with diabetes? (in terms of urgency, the number of people affected, the seriousness of the need that the intervention may resolve)<br>هل ممكن أن تتفضل وتقوم بترتيب هذه الاحتياجات بدأً بأهم احتياج ينبغي إعطاؤها الأولوية والاهتمام ثم الذي يليه وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم الاحتياج , هل هو طارئ, مدى خطورته وتأثيره , هل يوجد حلول مناسبة له .... | 5. From your point of view, what solutions could be implemented to meet these needs?<br>من وجهة نظرك: ما هي الحلول التي يمكن أن تنفذ لسد هذه الاحتياجات؟ | 6. What are the differences these solutions will make?<br>ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟ |
|---|---|---|---|
| **Health Needs** | Need Priority أولوية الاحتياج | Solutions الحلول | Difference made الفرق والتأثير |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

## Perception of healthcare needs

| **7. What problems (difficulties) have you encountered during the management of patients with diabetes in the** primary healthcare centre?<br><br>**Does the healthcare system face any problems in terms of management of patients with diabetes?**<br>**ما هي المشاكل التي واجهتها أثناء معالجتك لمرضى السكري بالرعاية الصحية الأولية؟ هل يواجه النظام الصحي أي مشاكل فيما يتعلق برعاية مرضى السكر؟** | **8. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five healthcare problems affecting healthcare of patients with diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)**<br>**هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري بدأً بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها ....** | **9. From your point of view, what solutions are needed for these problems?**<br>**ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟** | **10. What are the differences these solutions will make?**<br>**ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟** |
|---|---|---|---|
| **Healthcare (problems)** | Problem Priority أولوية المشاكل | Solutions الحلول | Difference التأثير والفرق made |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

| **11. What problems (difficulties) have you encountered during the management of patients with diabetes in the** hospitals & diabetes centres**?**<br><br>**ما هي المشاكل (الصعوبات) التي واجهتها أثناء متابعتك لمرضى السكري** بالمستشفيات ومراكز السكري**؟** | **12. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five healthcare problems affecting healthcare of patients with diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)**<br>**هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري بدأً بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها ....** | **13. From your point of view, what solutions are needed for these problems?**<br>**ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟** | **14. What are the differences these solutions will make?**<br>**ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟** |
|---|---|---|---|
| **Healthcare (problems) الصعوبات** | Problem Priority أولوية المشاكل | Solutions الحلول | Difference التأثير والفرق made |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

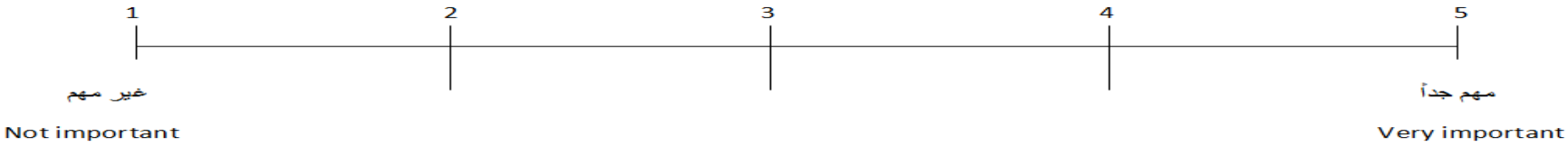
**15. Please specify if there are any population groups with diabetes whose health needs are not being currently met? Please tell us who they are and why: e.g. an entire ethnic group?**

**هل يمكن ان تحدد مجموعة معينة من مرضى السكر هم بأمس الحاجة للعناية الصحية او بمعنى آخر احتياجاتهم الصحية لم يتم تغطيتها حالياً بشكل جيد؟ على سبيل المثال مجموعة عرقية معينة، غير السعوديين، اهل القرى المجاورة..... كذلك هل يمكن ان توضح لماذا ؟**

## Perception of diabetes healthcare services

**16. From your point of view, how important is prevention in preventing diabetes in Saudi Arabia?**

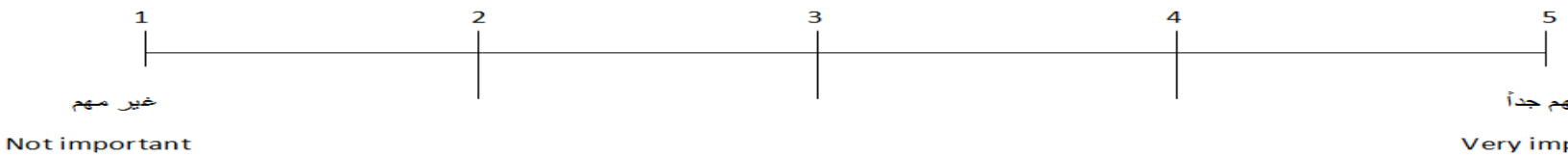
**من وجهة نظرك ما أهمية الوقاية في منع حدوث مرض السكري في المملكة ؟**




□ لا أعلم **(Don't Know)**

**17. From your point of view, how important is early diagnosis of diabetes by the screening programme in preventing diabetes?**

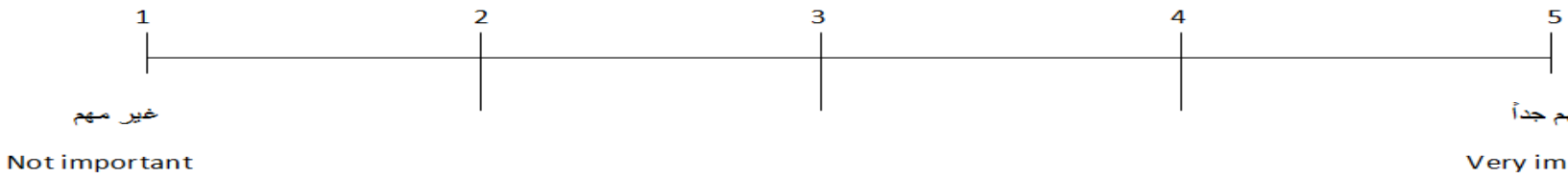
**من وجهة نظرك ما أهمية التشخيص المبكر لمرض السكري من خلال الفحص الدوري للسكري في الدم ؟**




☐ لا أعلم **(Don't Know)**

**18. From your point of view, how important is preventing diabetes complications in patients with diabetes?**

**من وجهة نظرك ما أهمية الحد من مضاعفات مرض السكري لدى مرض السكري ؟**




☐ لا أعلم **(Don't Know)**

| 19. What are the barriers for high risk groups to participate and utilize the available preventive services?<br>ما هي العوائق التي تمنع أولئك الذين على درجة خطورة عالية من احتمالية الاصابة بمرض السكري للمشاركة والاستفادة من مثل هذه الخدمات؟ |
| --- |
| |

| 20. What are the other primary healthcare services you think people with diabetes need to be available in each primary health care centre and currently are not available? E.g making appointment system, specific lab facilities, specific drugs, specific clinics...<br>ما هي الخدمات الصحية الأولية الأخرى التي تعتقد أن مرضى السكر يحتاجون توفرها في كل مركز صحي وهي غير متوفرة حالياً؟ مثلا خدمات مخبرية معينة، أدوية معينة، برامج معينة... |
| --- |
| |

| **21. What are the current primary healthcare services you think needs to be improved or changed? What are your suggestions to improve these services? E.g making appointment system, mini-clinics for diabetes, more clinics for dietician or podiatrists ...**<br>**ما هي الخدمات الصحية الأولية المتوفرة حالياً وتعتقد انها تحتاج تطوير أو تغيير؟ وما هو نوع التطوير او التغيير الذي تقترحه؟ مثلا خدمات مخبرية معينة، أدوية معينة، عيادات متخصصة مع اخصائي تغذية أو اخصائي قدم..** | |
|---|---|
| الخدمات Services | **نوع التطوير أو التغيير Needed improvements** |
| | |

| **22. What are the obstacles (barriers) and facilitators for the referral system?**<br>**كيف يعمل نظام الاحالة والتغذية الارجاعية لمرضى السكري ؟ ما العوامل التي تسهل عملية سير هذا النظام؟ وما هي العوائق التي تعيق عملية سير نظام الإحالة بشكل جيد؟** | |
|---|---|
| العوامل الميسرة Facilitating Factors | **العوائق Obstacles** |
| | |

| **23. From your perspective, what are the barriers and challenges to service improvements?**<br>**من وجهة نظرك ما هي التحديات التي تقف أمام تنفيذ هذه الاقتراحات والتطورات للرعاية الصحية لمرضى السكري؟** |
|---|
| |

| **24. Is there a continuous auditing system for the healthcare services you provide? □ Yes □ No If yes: How are the services you and your colleagues provide audited? If no, do you think the health services should be audited? □ Yes □ No**<br>**هل هناك تقييم ومراجعة مستمرة للخدمات الصحية التي تقدمونها؟ □ نعم □لا في حال الإجابة بنعم كيف يتم تقييم ومراجعة الخدمات الصحية التي تقدمونها؟ إذا كانت الخدمات لا تُقَيم فهل تعتقد انه يجب تقييم مدى جودة الخدمات الصحية من اجل تحديد سبل تطويرها بشكل مستمر؟ □ نعم □لا** |
|---|
| |

## Professional's details

| Questions/data items | Answers | Notes |
|---|---|---|
| **Healthcare centre's name: .....** | ☐ Primary level<br>☐ Secondary level | |
| **Age or date of birth:** | ☐ Youth (aged < 24)<br>☐ Adults (aged 25 – 64)<br>☐ Older People (aged 65+) | |
| **Gender:** | ☐ Male<br>☐ Female | |
| **Nationality :** | ☐ Saudi<br>☐ Non Saudi | |
| **What is your current occupation and specialty:** | | Work period/day: ☐ 0-5 hours ☐ 6-10 hours ☐ >10 hours |
| **Have you received any training on the management of diabetes?** | ☐ Yes.. if yes specify....<br>☐ No | |
| **Would you like to attend training courses on healthcare of people with diabetes?** | ☐ Yes.. if yes specify....<br>☐ No | |

- Check up the notes taken with the interviewee, check up after you have written the notes: 'What I have written down is… Have I noted that down OK, or do you want to change something? Allows the interviewee to (re)consider what has been said while you write and expand the answers

Part 3

# Semi-structured interview schedule for health managers

## Preamble

أريد أن أتحدث إليك عن الاحتياجات الصحية للأشخاص الذين يعانون من مرض السكري وعن خدمات الرعاية الصحية في مدينة أبها. أنا مهتم في التصدي لمشكلة داء السكري في المملكة العربية السعودية و كيفية تحسين الرعاية الصحية للأشخاص الذين يعانون من مرض السكري. أريد أن أسمع عن أي أفكار لديك والتي من شأنها أن تجعل صحة مرضى السكري على نحو أفضل. يهدف هذا اللقاء للبحث في دورك الخاص في تحسين خدمات الرعاية الصحية لدينا وكيف تستشعر إمكانية تغيير الخدمات الصحية لتلبي بطريقة أفضل إحتياجات الأشخاص الذين يعانون من مرض السكري. يرجى إعطاء أكبر قدر من المعلومات.

**Warm up question**

| **1. What is your role and responsibilities in providing healthcare to people with diabetes? Do you think roles and responsibilities need to be specified and organized? □ Yes □ No**<br>**ما هو دورك ومسؤولياتك في تقديم الرعاية الصحية لمرضى السكري؟ هل تعتقد أن الأدوار والمسؤوليات تحتاج لتحديد وتنظيم؟ □ نعم □لا** | |
|---|---|
| □ دور وقائي Preventive role<br>□ دور إداري Administration role<br>□ دور علاجي Treating role<br>□ دور عناية Caring role | □ **دور تأهيلي Rehabilitation role**<br>□ **دور تثقيفي Education role**<br>□ **أخرى Other?** |

## Perception of national health problems

| **2. What are the most prevalent health problems? Which problems have most impact on health at the national level?**<br>**ما هي المشاكل الصحية الأكثر انتشاراً و الأكثر تأثيراً على الصحة على المستوى الوطني ؟** |
|---|
| |

## Perception of health needs

| 3. What are the health needs that have not been currently met for patients with diabetes?<br>ما هي الاحتياجات الصحية التي لم يتم حالياً تغطيتها أو توفيرها لمرضى السكري؟ | 4. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five needs for health of people with diabetes? (in terms of urgency, the number of people affected, the seriousness of the need that the intervention may resolve)<br>هل ممكن أن تتفضل وتقوم بترتيب هذه الاحتياجات بدأً بأهم احتياج ينبغي إعطاؤها الأولوية والاهتمام ثم الذي يليه وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم الاحتياج , هل هو طارئ, مدى خطورته وتأثيره , هل يوجد حلول مناسبة له .... | 5. From your point of view, what solutions could be implemented to meet these needs?<br>من وجهة نظرك: ما هي الحلول التي يمكن أن تنفذ لسد هذه الاحتياجات؟ | 6. What are the differences these solutions will make?<br>ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟ |
|---|---|---|---|
| **Health Needs** | Need Priority أولوية الاحتياج | Solutions الحلول | Difference made الفرق والتأثير |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

## Perception of healthcare needs

| **7. What problems (difficulties) have you encountered during the management of patients with diabetes in the** primary healthcare centre?<br><br>**Does the healthcare system face any problems in terms of management of patients with diabetes?**<br>**ما هي المشاكل التي واجهتها أثناء معالجتك لمرضى السكري بالرعاية الصحية الأولية؟ هل يواجه النظام الصحي أي مشاكل فيما يتعلق برعاية مرضى السكر؟** | **8. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five healthcare problems affecting healthcare of patients with diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)**<br>**هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري بدأً بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها ....** | **9. From your point of view, what solutions are needed for these problems?**<br>**ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟** | **10. What are the differences these solutions will make?**<br>**ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟** |
|---|---|---|---|
| **Healthcare (problems)** | Problem Priority أولوية المشاكل | Solutions الحلول | Difference made التأثير والفرق |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

| **11. What problems (difficulties) have you encountered during the management of patients with diabetes in the** hospitals & diabetes centres**?**<br><br>**ما هي المشاكل (الصعوبات) التي واجهتها أثناء متابعتك لمرضى السكري** بالمستشفيات ومراكز السكري**؟** | **12. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five healthcare problems affecting healthcare of patients with diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)**<br>**هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري بدأً بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها ....** | **13. From your point of view, what solutions are needed for these problems?**<br>**ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟** | **14. What are the differences these solutions will make?**<br>**ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟** |
|---|---|---|---|
| **Healthcare (problems) الصعوبات** | Problem Priority أولوية المشاكل | Solutions الحلول | Difference made التأثير والفرق |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

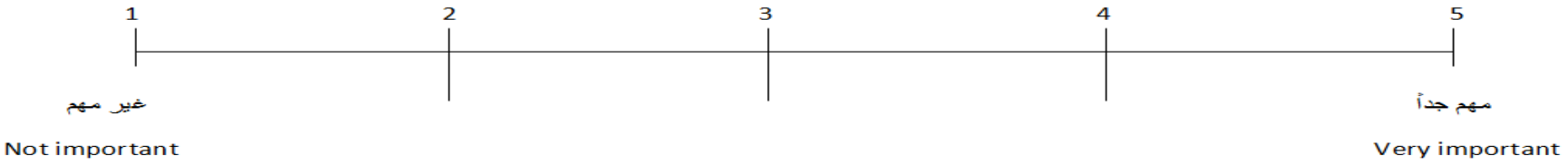
**15. Please specify if there are any population groups with diabetes whose health needs are not being currently met? Please tell us who they are and why: e.g. an entire ethnic group?**

**هل يمكن أن تحدد مجموعة معينة من مرضى السكر هم بأمس الحاجة للعناية الصحية أو بمعنى آخر احتياجاتهم الصحية لم يتم تغطيتها حالياً بشكل جيد؟ على سبيل المثال مجموعة عرقية معينة، غير السعوديين، أهل القرى المجاورة..... كذلك هل يمكن أن توضح لماذا ؟**

## Perception of diabetes healthcare services

**16. From your point of view, how important is prevention in preventing diabetes in Saudi Arabia?**

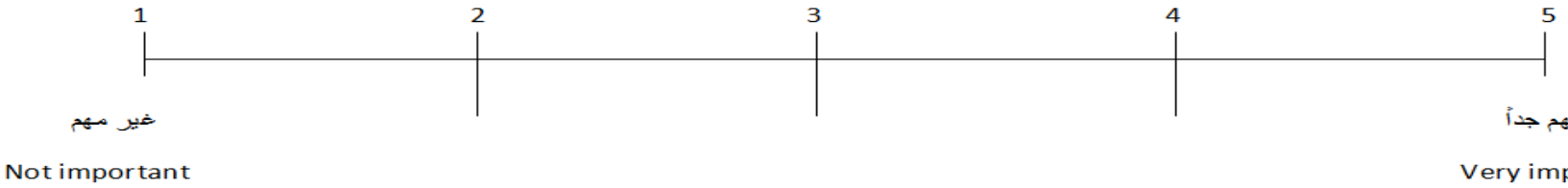
**من وجهة نظرك ما أهمية الوقاية في منع حدوث مرض السكري في المملكة ؟**




☐ لا أعلم **(Don't Know)**

**17. From your point of view, how important is early diagnosis of diabetes by the screening programme in preventing diabetes?**

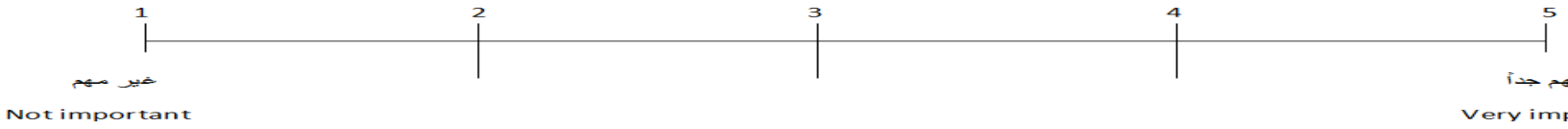
**من وجهة نظرك ما أهمية التشخيص المبكر لمرض السكري من خلال الفحص الدوري للسكري في الدم ؟**




☐ لا أعلم **(Don't Know)**

**18. From your point of view, how important is preventing diabetes complications in patients with diabetes?**

**من وجهة نظرك ما أهمية الحد من مضاعفات مرض السكري لدى مرض السكري ؟**




☐ لا أعلم **(Don't Know)**

| 19. What are the barriers for high risk groups to participate and utilize the available preventive services?<br>ما هي العوائق التي تمنع أولئك الذين على درجة خطورة عالية من احتمالية الإصابة بمرض السكري للمشاركة والاستفادة من مثل هذه الخدمات؟ |
| --- |
| |

| 20. What are the other primary healthcare services you think people with diabetes need to be available in each primary health care centre and currently are not available? E.g making appointment system, specific lab facilities, specific drugs, specific clinics...<br>ما هي الخدمات الصحية الأولية الأخرى التي تعتقد أن مرضى السكر يحتاجون توفرها في كل مركز صحي وهي غير متوفرة حالياً؟ مثلا خدمات مخبرية معينة، أدوية معينة، برامج معينة... |
| --- |
| |

| 21. What are the current primary healthcare services you think needs to be improved or changed? What are your suggestions to improve these services? E.g making appointment system, mini-clinics for diabetes, more clinics for dietician or podiatrists ...<br>ما هي الخدمات الصحية الأولية المتوفرة حالياً وتعتقد أنها تحتاج تطوير أو تغيير؟ وما هو نوع التطوير أو التغيير الذي تقترحه؟ مثلا خدمات مخبرية معينة، أدوية معينة، عيادات متخصصة مع أخصائي تغذية أو أخصائي قدم.. | |
|---|---|
| الخدمات Services | نوع التطوير أو التغيير Needed improvements |
| | |



| 22. What are the obstacles (barriers) and facilitators for the referral system?<br>كيف يعمل نظام الإحالة والتغذية الارتجاعية لمرضى السكري ؟ ما العوامل التي تسهل عملية سير هذا النظام؟ وما هي العوائق التي تعيق عملية سير نظام الإحالة بشكل جيد؟ | |
|---|---|
| العوامل الميسرة Facilitating Factors | العوائق Obstacles |
| | |

| **23. From your perspective, what are the barriers and challenges to services improvement?**<br>**من وجهة نظرك ما هي التحديات التي تقف أمام تنفيذ هذه الاقتراحات والتطورات للرعاية الصحية لمرضى السكري؟** |
|---|
| |

| **24. Is there a continuous auditing system for the healthcare services you provide? □ Yes □ No If yes: How are the services you and your colleagues provide audited? If no, do you think the health services should be audited? □ Yes □ No**<br>**هل هناك تقييم ومراجعة مستمرة للخدمات الصحية التي تقدمونها؟ □ نعم □لا في حال الإجابة بنعم كيف يتم تقييم ومراجعة الخدمات الصحية التي تقدمونها؟ إذا كانت الخدمات لا تُقَيم فهل تعتقد انه يجب تقييم مدى جودة الخدمات الصحية من اجل تحديد سبل تطويرها بشكل مستمر؟ □ نعم □لا** |
|---|
| |

## Manager's details

| Questions/data items | Answers | Notes |
|---|---|---|
| **Healthcare centre's name:**<br>**……** | ☐ Primary level<br>☐ Secondary level | |
| **Age or date of birth:** | ☐ Youth (aged < 24)<br>☐ Adults (aged 25 – 64)<br>☐ Older People (aged 65+) | |
| **Gender:** | ☐ Male<br>☐ Female | |
| **Nationality :** | ☐ Saudi<br>☐ Non Saudi | |
| **What is your current occupation and specialty:** | | Work period/day: ☐ 0-5 hours ☐ 6-10 hours ☐ >10 hours |
| **Have you received any training on the management of diabetes?** | ☐ Yes.. if yes specify....<br>☐ No | |
| **Would you like to attend training courses on healthcare of people with diabetes?** | ☐ Yes.. if yes specify....<br>☐ No | |

- Check up the notes taken with the interviewee, check up after you have written the notes: 'What I have written down is… Have I noted that down OK, or do you want to change something?
- Allows the interviewee to (re)consider what has been said while you write and expand the answers.

Part 4

# Semi-structured interview schedule for pharmacists

## Preamble

أريد أن أتحدث إليك عن الاحتياجات الصحية للأشخاص الذين يعانون من مرض السكري وعن خدمات الرعاية الصحية في مدينة أبها. أنا مهتم في التصدي لمشكلة داء السكري في المملكة العربية السعودية و كيفية تحسين الرعاية الصحية للأشخاص الذين يعانون من مرض السكري. أريد أن أسمع عن أي أفكار لديك والتي من شأنها أن تجعل صحة مرضى السكري على نحو أفضل. يهدف هذا اللقاء للبحث في دورك الخاص في تحسين خدمات الرعاية الصحية لدينا وكيف تستشعر إمكانية تغيير الخدمات الصحية لتلبي بطريقة أفضل إحتياجات الأشخاص الذين يعانون من مرض السكري. يرجى إعطاء أكبر قدر من المعلومات.

## Warm up question

| |
|---|
| **1. What is your role and responsibilities in providing healthcare to people with diabetes? Do you think roles and responsibilities need to be specified and organized? □ Yes □ No**<br>**ما هو دورك ومسؤولياتك في تقديم الرعاية الصحية لمرضى السكري؟ هل تعتقد أن الأدوار والمسؤوليات تحتاج لتحديد وتنظيم؟ □ نعم □لا** |
| □ دور وقائي Preventive role<br>□ دور إداري Administration role<br>□ دور علاجي Treating role<br>□ دور عناية Caring role<br>□ دور تأهيلي Rehabilitation role<br>□ دور تثقيفي Education role<br>□ أخرى Other? |

## Perception of pharmacy problems

| 2. Does the centre's pharmacy experience supply problems? If yes, what are these problems and what are the suggested solutions for these problems?<br>هل صيدلية المركز تعاني من مشاكل بخصوص تزويدكم بالأدوية؟ □ نعم □لا ما هي هذه المشاكل ؟ | 3. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five healthcare problems affecting healthcare of patients with diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)<br>هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري بدأً بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها | 4. From your point of view, What solutions are needed for these problems?<br>ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟ | 5. What are the differences these solutions will make?<br>ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟ |
|---|---|---|---|
| **Supply problems مشاكل توفير الأدوية** | Problem Priority أولوية المشاكل | Solutions الحلول | Difference made التأثير والفرق |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

| 6. Are there any other problems in your pharmacy that might affect people with diabetes?<br><br>هل هناك أي مشاكل أخرى تعاني منها الصيدلية يمكن أو تؤثر على مرضى السكري؟ | 7. Could you please rank from 1-5 (1 being the highest priority) what you think are the top five pharmacy problems affecting healthcare of patients with diabetes? (in terms of urgency, the seriousness of the problem that the intervention may resolve)<br>هل ممكن أن تتفضل وتقوم بترتيب هذه المشاكل التي تؤثر على الرعاية الصحية لمرض السكري بدأً بأهم مشكلة ينبغي إعطاؤها الأولوية والاهتمام ثم التي تليها وهكذا ؟ يمكن الأخذ بعين الاعتبار حجم المشكلة , هل هي طارئة, مدى خطورتها وتأثيرها على مرضى السكر , هل يوجد حلول مناسبة لها | 8. From your point of view, What solutions are needed for these problems?<br>ما هي الحلول الضرورية من وجهة نظرك لهذه المشاكل؟ | 9. What are the differences these solutions will make?<br>ما هو الفرق الذي ستحققه مثل هذه الحلول من وجهة نظرك؟ |
|---|---|---|---|
| **Other problems مشاكل أخرى** | **Problem Priority أولوية المشاكل** | **Solutions الحلول** | **Difference made التأثير والفرق** |
| | 1. | 1. | 1. |
| | 2. | 2. | 2. |
| | 3. | 3. | 3. |
| | 4. | 4. | 4. |
| | 5. | 5. | 5. |

| 10. Could you please explain how the diabetes drugs are supplied? هل ممكن ان تتفضل وتشرح كيف يتم تزويدكم بأدوية السكري ؟ |
|---|
| |

## Drug availability

| 11. For each drug below, what is their availability in this pharmacy? لكل من الأدوية أدناه، ما هو مستوى توفرها ؟ | | |
|---|---|---|
| Drugs | **Its availability** | **Notes** |
| **Metformin** | ☐ Always available<br>☐ Sometimes available<br>☐ Not available | |
| **Glibenclamide** | ☐ Always available<br>☐ Sometimes available<br>☐ Not available | |
| **Gliclazide** | ☐ Always available<br>☐ Sometimes available<br>☐ Not available | |
| **Glipizide** | ☐ Always available | |

| | | |
|---|---|---|
| | □ Sometimes available<br>□ Not available | |
| **Glinide** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **Aspart or Lispro (Rapid-acting)** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **Regular insulin (Short-acting)** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **NPH insulin (Intermediate-acting)** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **A mixture of NPH and regular insulin** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **Antihypertensives: ACEIs (Angiotensin-Converting Enzyme Inhibitors), Beta-blockers diuretics, etc.** | □ Always available<br>□ Sometimes available<br>□ Not available | |

| | | |
|---|---|---|
| **Cholesterol-lowering drugs: statins** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **Consumables: needles, syringes, urine test strips, capillary blood glucose test strips,** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **I.V. Glucose solution** | □ Always available<br>□ Sometimes available<br>□ Not available | |
| **Others** | □ Always available<br>□ Sometimes available<br>□ Not available | |

## Dispensing drugs to patients

| **12. Do you have a dispensing mechanism or protocol for delivering diabetes drugs? If yes, what is it and how it works?**<br>**هل لديكم آلية لصرف أدوية السكري؟ ما هي وكيف تعمل؟** |
|---|
| |

## Pharmacy team

| **13. Who is the pharmacy team composed of? What training have they had?**<br>**ممن يتكون فريق الصيدلية؟ وما مستويات التدريب والشهادات الحاصلين عليها؟** | |
|---|---|
| **Team member** | Training level |
| | |
| | |
| | |
| | |
| | |

## Training needs

| **14. What training courses would you like to attend?**<br>**ماهي المناهج التدريبية التي ترغب بحضورها؟** |
| --- |
| |

## Pharmacist's details

| Questions/data items | Answers | Notes |
|---|---|---|
| **Healthcare centre's name:** …… | □ Primary level<br>□ Secondary level | |
| **Age or date of birth:** | □ Youth (aged < 24)<br>□ Adults (aged 25 – 64)<br>□ Older People (aged 65+) | |
| **Gender:** | □ Male<br>□ Female | |
| **Nationality :** | □ Saudi<br>□ Non Saudi | |
| **What is your current occupation and specialty:** | | Work period/day: □ 0-5 hours □ 6-10 hours □ >10 hours |
| **Have you received any training on the drug management of diabetes?** | □ Yes.. if yes specify....<br>□ No | |
| **Would you like to attend training courses on healthcare of people with diabetes?** | □ Yes.. if yes specify....<br>□ No | |

- Check up the notes taken with the interviewee, check up after you have written the notes: 'What I have written down is… Have I noted that down OK, or do you want to change something?
- Allows the interviewee to (re)consider what has been said while you write and expand the answers.

## Appendix 16: Invitation letter for healthcare staff to join the research team


# INVITATION LETTER


*This is your invitation to join*
***Abha Diabetes research team***
*An innovative team working together to improve health of people with diabetes*

# Diabetes needs your attention!!!

## Abha diabetes research team

Dear Colleague

This letter is a formal invitation to join the Abha Diabetes Research Team. We are looking for interested, responsible and motivated healthcare professionals to be part of a newly formed research team. The members of this team will work together in innovative ways to improve the health of people with diabetes in Abha. The team will commence its activities with several meetings and workshops on how to assess the health needs of diabetic people in Abha.

Health Needs Assessment (HNA) is an essential tool for health service planning & commissioning; its primary outputs are a set of recommendations, an action strategy and identification of effective & acceptable interventions. These can be used to influence policies and service delivery in order to improve health of people with diabetes.

The primary objective of the research team is to carry out & publish research that focuses on improving the health of people with diabetes.



The members will have a chance of gaining a practical, hands-on experience in conducting research alongside Prof. Iain Crombie and Dr. Linda Irvine, experienced researchers and supervisors of the HNA project. You will gain also experience of working in authentic research settings and gaining a variety of research skills. You will be directly involved in every aspect of conducting HNA, including health profiling, deciding on priorities for action, planning public health programmes to address the priority issues and planning for implementation and evaluation.

Dr. Abdullah Alshehri will lead this project as part of his PhD in Public Health Policy. The research team will meet once every week in the college of medicine, King Khalid University. Participation in the research team is completely voluntary, thus our team approach will be on shared aims and responsibilities and shared rewards.

Bring your ideas and join us!

You can join us through filling a web-based membership form by visiting the following web-link:

https://sites.google.com/site/abhadiabetesresearchteam/home

For inquiries, see page 4

## *Inquiries*

Dr. Abdullah Alshehri welcomes all your inquiries concerning the Abha Diabetes Research Team. Please forward all correspondence to:
E-mail: dr.alsabaani@hotmail.com
or call :
UK mobile: 0044 7 5333 10815
UK Phone: 0044 1382 420108
Saudi Mobile: 00966 5308 2394

**Thank you for considering this invitation.**

## Appendix 17: Participant information sheets for patients and healthcare professionals, English and Arabic versions

*PARTICIPANT INFORMATION SHEET (for patients)*

### DIABETES HEALTH NEEDS ASSESSMENT IN ABHA CITY, SAUDI ARABIA

**INVITATION TO TAKE PART IN A RESEARCH STUDY**

You are being asked to take part in a research project, which aims to identify the health and healthcare needs of patients with diabetes. We are a group of healthcare professionals who are interested in improving the healthcare management of patients with diabetes in Abha city. The team leader is Dr Abdullah Alshehri and the supervisor is Professor Iain Crombie.

**PURPOSE OF THE RESEARCH STUDY**

In this study, the research team will interview patients, healthcare providers and managers and ask them about their perceptions of what patients with diabetes need in terms of health and healthcare. During this project you will be asked to complete a questionnaire asking about your health, the health needs of patients with diabetes and the health care services they are currently receiving. You may also be invited to a meeting in order to give your view about health needs of patients with diabetes.

Participation in this research would benefit first our government, represented by the Ministry of Health, to improve the delivery of healthcare services based on understanding what patients need. Second, people with diabetes would benefit by receiving better healthcare that meets their needs. Third, Healthcare professionals would also benefit from this project by in-depth understanding of what people with diabetes need.

**TIME COMMITMENT**

The study will involve interview of about 30 minutes, for those invited to a meeting, the duration will be less than 1 hour. The meeting will be held at your primary healthcare centre, hospital or diabetes centre.

**TERMINATION OF PARTICIPATION**

Participation in this research is completely voluntary. You may decide to stop being a part of the research study at any time without explanation.

**RISKS**

There are no known risks for you in this study.

**CONFIDENTIALITY/ANONYMITY**

The data we collect do not contain any personal information about you. No one will link the data you provided to your identity and name. It is anticipated that the findings of the study will be written up for publication in a peer reviewed journal and presented at international conferences. All results will be anonymised and it will not be possible to identify individual participant's data.

**FOR FURTHER INFORMATION ABOUT THIS RESEARCH STUDY**

Dr Abdullah Alshehri will be glad to answer your questions about this study at any time. If you want to find out about the final results of this study, you can just send an email to Dr Abdullah Alshehri at dr.alsabaani@hotmail.com or A.Alshehri@cpse.dundee.ac.uk. You may also contact:

Department of Public Health
School of Medicine
University of Dundee
Mackenzie Building
Kirsty Semple Way
Dundee
Scotland
DD2 4BF

*PARTICIPANT INFORMATION SHEET (for healthcare professional)*

# DIABETES HEALTH NEEDS ASSESSMENT IN ABHA CITY, SAUDI ARABIA

**INVITATION TO TAKE PART IN A RESEARCH STUDY**

You are being asked to take part in a research project, which aims to identify the health and healthcare needs of patients with diabetes. We are a group of healthcare professionals who are interested in improving the healthcare management of patients with diabetes in Abha city. The team leader is Dr Abdullah Alshehri and the supervisor is Professor Iain Crombie.

**PURPOSE OF THE RESEARCH STUDY**

In this study, the research team will interview patients, healthcare providers and managers and ask them about their perceptions of what patients with diabetes need in terms of health and healthcare. Meetings & discussions will then be conducted to prioritize the identified needs. Actions will be planned to meet the most significant needs. A set of recommendations will then be developed to guide and influence the health policy of delivering healthcare services to patients with diabetes. During this project you will be asked to complete a questionnaire asking about your health, the health needs of patients with diabetes and the health care services they are currently receiving. You may also be invited to a meeting in order to give your view about health needs of patients with diabetes.

Participation in this research would benefit first our government, represented by the ministry of health, to improve the delivery of healthcare services based on understanding what patients need. Second, people with diabetes would benefit by receiving better healthcare that meets their needs. Third, Healthcare professionals would also benefit from this project by in-depth understanding of what people with diabetes need.

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The study will involve interview of about 30 minutes, for those invited to a meeting, the duration will be less than 1 hour. The meeting will be held at your primary healthcare centre, hospital or diabetes centre.

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**RISKS**

There are no known risks for you in this study.

**CONFIDENTIALITY/ANONYMITY**

The data we collect do not contain any personal information about you. No one will link the data you provided to your identity and name. It is anticipated that the findings of the study will be written up for publication in a peer reviewed journal and presented at international conferences. All results will be anonymised and it will not be possible to identify individual participant's data.

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Kirsty Semple Way
Dundee/Scotland
DD2 4BF

ورقة معلومات للمشاركين (نسخة المريض)

# تقييم الاحتياجات الصحية لمرضى السكري بمدينة أبها، المملكة العربية السعودية

**الدعوة للمشاركة في دراسة بحثية**

أنت مدعو للمشاركة في مشروع بحثي يهدف إلى التعرُّف على الاحتياجات الصحية واحتياجات العناية الصحية للمرضى الذين يعانون من مرض السكري . نحن مجموعة من المتخصصين في الرعاية الصحية ونرغب في تحسين الرعاية الصحية لمرضى السكري في مدينة أبها. قائد الفريق هو الدكتور عبد الله الشهري والمشرف على البحث هو البروفيسور ايان كرومبي.

**الغرض من هذه الدراسة**

في هذه الدراسة ، سيقابل فريق البحث كل من مرضى السكري ومقدمي الرعاية الصحية ومديري المراكز والمستشفيات وسيتم سؤالهم عن تصوراتهم لما يحتاجه المرضى الذين يعانون من مرض السكري من حيث الحاجة للصحة والرعاية الصحية. خلال هذا المشروع سيتم دعوتك إلى لقاء من أجل اعطاء وجهة نظركم حول الاحتياجات الصحية للمرضى الذين يعانون من مرض السكري. قد يُطلب منك أن تجيب على استبيان يسأل عن حالتك الصحية وعن الاحتياجات الصحية لمرضى السكري وعن خدمات الرعاية الصحية المقدمه حالياً.

المشاركة في هذا المشروع البحثي ستفيد أولاً مصلحة وطننا وحكومتنا الرشيدة ممثلة في وزارة الصحة، وذلك من خلال تحسين تقديم خدمات الرعاية الصحية على أساس فهم ما يحتاجه المرضى. ثانيا سيفيد البحث مرضى السكري من خلال تلقي الرعاية الصحية أفضل وتلبي احتياجاتهم . ثالثاً سيفيد هذا المشروع البحثي المتخصصين في الرعاية الصحية من خلال الفهم المتعمق لما يحتاجه مرض السكري.

**التزامات الوقت**

المشاركة في هذه الدراسة تحتاج منك فقط لمقابلة الباحث لمدة تقارب 30 دقيقة ولقاء لمدة أقل من ساعة. اللقاء سيكون إما بالمركز الصحي أو المستشفى أو مركز السكري.

**إنهاء مشاركة**

المشاركة في هذا البحث تطوعية تماما ويمكن أن تقرر التوقف عن المشاركة في أي وقت دون تفسير.

**المخاطر**

لا يُعرف هناك أية مخاطر بالنسبة لمشاركتك في هذه الدراسة.

**السرية / عدم الكشف عن الهويه**

البيانات التي نجمعها لا تحتوي على أية معلومات شخصية عنك .لا أحد يستطيع ربط البيانات التي قدمتها لهويتك واسمك. من المتوقع أن النتائج التي توصلت إليها الدراسة سوف تكون مكتوبة ومنشورة في مجلات علمية محكمة. ويمكن أن تُقَدم في المؤتمرات الدولية. كل نتائج الدراسة ستكون مجهول المصدر بحيث لن يتمكن أي أحد من تحديد هوية الأفراد المشاركين أو المراكز الصحية والمستشفيات المشاركة.

**مزيد من المعلومات عن هذه الدراسة البحثية**

الدكتور عبد الله الشهري سيكون سعيدا للإجابة على أسئلتكم حول هذه الدراسة في أي وقت .إذا كنت تريد معرفة النتائج النهائية لهذه الدراسة ، يمكنك فقط إرسال بريد إلكتروني إلى: dr.alsabaani@hotmail.com أو a.alshehri@cpse.dundee.ac.uk

كما يمكنك مراسلة جامعة دندي باسكوتلاندا على العنوان التالي:

Department of Public Health
School of Medicine
University of Dundee
Mackenzie Building
Kirsty Semple Way
Dundee
Scotland
DD2 4BF

**ورقة معلومات للمشاركين (نسخة الممارسين الصحيين)**

# تقييم الاحتياجات الصحية لمرضى السكري بمدينة أبها، المملكة العربية السعودية

**الدعوة للمشاركة في دراسة بحثية**

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في هذه الدراسة ، سيقابل فريق البحث كل من مرضى السكري ومقدمي الرعاية الصحية ومديري المراكز والمستشفيات وسيتم سؤالهم عن تصوراتهم لما يحتاجه المرضى الذين يعانون من مرض السكري من حيث الحاجة للصحة والرعاية الصحية. خلال هذا المشروع سيتم دعوتك إلى لقاء من أجل اعطاء وجهة نظركم حول الاحتياجات الصحية للمرضى الذين يعانون من مرض السكري. قد يُطلب منك أن تجيب على استبيان يسأل عن الاحتياجات الصحية لمرضى السكري وعن خدمات الرعاية الصحية المقدمه حالياً. سيقوم فريق البحث بعد ذلك بعقد مجموعة من حلقات النقاش لترتيب الاحتياجات حسب الأولوية ومن ثم التخطيط لتقديم تدخلات مناسبة لتلبية هذه الاحتياجات وبناء عليه سيتم التوصل الى وضع مجموعة من التوصيات للإرشاد ودعم عملية تطوير الخدمات الصحية المقدمة لمرضى السكري.

المشاركة في هذا المشروع البحثي ستفيد أولاً مصلحة وطننا وحكومتنا الرشيدة ممثلة في وزارة الصحة، وذلك من خلال تحسين تقديم خدمات الرعاية الصحية على أساس فهم ما يحتاجه المرضى. ثانيا سيفيد البحث مرضى السكري من خلال تلقي الرعاية الصحية أفضل وتلبي احتياجاتهم . ثالثاً سيفيد هذا المشروع البحثي المتخصصين في الرعاية الصحية من خلال الفهم المتعمق لما يحتاجه مرض السكري.

**التزامات الوقت**

المشاركة في هذه الدراسة تحتاج منك فقط لمقابلة الباحث لمدة تقارب 30 دقيقة ولقاء لمدة أقل من ساعة. اللقاء سيكون إما بالمركز الصحي أو المستشفى أو مركز السكري.

**إنهاء مشاركة**

المشاركة في هذا البحث تطوعية تماما ويمكن أن تقرر التوقف عن المشاركة في أي وقت دون تفسير.

**المخاطر**

لا يُعرف هناك أية مخاطر بالنسبة لمشاركتك في هذه الدراسة.

**السرية / عدم الكشف عن الهويه**

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**مزيد من المعلومات عن هذه الدراسة البحثية**

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كما يمكنك مراسلة جامعة دندي باسكوتلاندا على العنوان التالي:

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DD2 4BF

## Appendix 18: Informed consent form for taking part in the study

INFORMED CONSENT FORM نموذج الموافقة عن علم

DIABETES HEALTH NEEDS ASSESSMENT IN ABHA CITY, SAUDI ARABIA

تقييم الاحتياجات الصحية لمرضى السكري بمدينة أبها، المملكة العربية السعودية

PROJECT SUMMARY

Health needs assessment is a systematic method of identifying unmet health and health care needs of a population, and making changes to meet these unmet needs. The aim of this project is to identify the health and healthcare needs of people with diabetes, by interviewing patients, healthcare providers and managers. The identified needs will be prioritized and actions will be planned to meet the most significant needs. A set of recommendations then will be developed to guide and influence the health policy of delivering healthcare services to patients with diabetes.

By signing below you are agreeing that you have read and understood the Participant Information Sheet and that you agree to take part in this research study.

**ملخص المشروع**

تقييم الاحتياجات الصحية هو أسلوب منهجي لتحديد احتياجات السكان للصحة وللرعاية الصحية التي لم تلب، وإجراء تغييرات لتلبية هذه الاحتياجات. الهدف من هذا المشروع هو تحديد الاحتياجات الصحية والاحتياجات للرعاية الصحية للأشخاص الذين يعانون من مرض السكري، وذلك من خلال إجراء مقابلات مع المرضى ومقدمي الرعاية الصحية والمديرين. الاحتياجات المكتشفة سترتب بحسب الأولوية ومن ثم سيتم مناقشة هذه الاحتياجات والتخطيط لأعمال وترتيبات متاحة لتلبية الاحتياجات الأكثر أهمية. وسيتم وضع مجموعة من التوصيات بعد ذلك للتوجيه والتأثير في السياسة الصحية العامة لتقديم خدمات الرعاية الصحية لمرضى السكري.
بالتوقيع أدناه، فإنك توافق على أنك قد قرأت وفهمت ورقة المعلومات المتعلقة بالمشتركين وأنك توافق على المشاركة في هذه الدراسة البحثية.

إسم المشارك Participant's name

.....

التوقيع Participant's signature

التاريخ Date ..... 

..../..../2011

إسم الباحث المتحصل على الموافقة Name of person obtaining consent

.....

توقيع الباحث المتحصل على الموافقة Signature of person obtaining consent

التاريخ Date .....

..../..../2011

## Appendix 19: Combined lists of responses (codes), themes and categories to the interview questions for all the key informants.

**List 19.1:** List of reported responses to the questions* about the health needs and problems encountered during diabetes management.

* Patient interview: questions number 3, 4, 7, 8, 11 and 12; healthcare professional interview: questions number 3, 4, 7, 8, 11 and 12; healthcare manager interview: questions number 3, 4, 7, 8, 11 and 12; pharmacist interview: questions number 2, 3, 6 and 7.

| Category | Theme | Response (code) |
|---|---|---|
| Availability of healthcare resources | Laboratory and its resources | Laboratory and all laboratory investigations |
| | | HbA1C test |
| | | ECG test |
| | | X-ray machine |
| | | Cholesterol and triglyceride tests |
| | | Urinalysis strips |
| | | Glucometer strips for laboratory |
| | | Renal function tests and liver function tests |
| | | Specific Laboratory for diabetics only |
| | Pharmacy and its resources | A Pharmacy |
| | | Insufficient availability of drugs (including anti-diabetes drugs) |
| | | New anti-diabetes drugs |
| | | High quality anti-diabetes drugs |
| | | Insulin |
| | | Angiotensin receptor blockers (ARBs) drugs |
| | | Increase range of insulin types available (Lantus, Mixtard, and Apidra) |
| | | Insulin devices and pens |
| | | Aspirin |
| | | Statins |
| | | Multivitamins |
| | | Impotence treatments |
| | | Glucometer, its strips and needles |
| | | Insulin syringes |
| | | Small insulin syringes (for children) |
| | | Alcohol swabs |
| | | Nearly to expire drugs |
| | | Device for printing dosage information |
| | | Medical support devices such as wheelchair, medical shoes, spectacles, drawers |
| | | Sphygmometer / electronic sphygmometer |
| | | Insulin Keeper (small refrigerators) |
| | Healthcare manpower | Insufficient working staff |
| | | Trained staff (specialists) |

| | | |
|---|---|---|
| | | Dietician clinic (dietician) |
| | | Podiatrist clinic (podiatrist) |
| | | Ophthalmology clinic (ophthalmologist) |
| | | Optometrist |
| | | Dental clinic (dentist/dental assistant) |
| | | Diabetologist clinic (diabetologist) |
| | | Health education clinic (Health educator) |
| | | Social worker |
| | | Trained nurses |
| | | Geriatrist |
| | | Family medicine physicians (specialist, trained physicians, specialist clinics) |
| | | Female physician |
| | | Female pharmacist |
| | | Trained pharmacist |
| | | Psychiatrist |
| | | Paediatric physician (specialist/ diabetologist) |
| | | Nephrologists |
| | | Adult endocrinologist |
| | | Biomechanics |
| | | Lab technician |
| | | Male nurses |
| | | Physiotherapist |
| | Other hospital and PHCC resources | Diabetes centres (more than one) |
| | | Expanding the diabetes centre |
| | | A laboratory in the diabetes centre |
| | | A laboratory in Johaan PHCC |
| | | A pharmacy in the diabetes centre |
| | | Meeting and gathering space in PHCCs for patients |
| | | More wider waiting area |
| | | Underdeveloped PHCCs/ Modern PHCCs/ PHCCs with insufficient resources |
| | | A library |
| | | Dressing materials |
| | | Torch |
| | | Monofilaments |
| | | Computer and printer |
| | | Peak flow meter |
| | | Old devices/new modern devices |
| | | Electronic system or computer system |
| | | Training courses for all professionals |
| | | New governmental buildings for PHCCs |
| | | Special well equipped department for diabetes |
| | | Pancreas transplantation |

| | | |
|---|---|---|
| Healthcare processes (system) | Laboratory system | HbA1c only available for one day per week in Abha General Hospital (to be everyday) |
| | | Delayed test results |
| | Pharmacy system | Update the MOH essential drug list/ some drugs need to be added to the list |
| | | Pharmacist in PHCC should not himself go to collect drugs from the drug supply centre and leave the PHCC pharmacy during working hours/ Inappropriate methods of drug transfer |
| | | Delayed provision of requested drugs/ difficulties of drug provision |
| | | Providing an amount of drugs less than the requested amount |
| | | Electronic drug dispensing and prescription system/ Drug information electronic system |
| | | Uncontrolled drug dispensing |
| | | Updating regularly drug dosage information in patient's diabetes card |
| | | Provision of a prescription card where diabetics can get their medications from any pharmacy |
| | | Deliver drugs to home |
| | | Drugs are not available at the night shift |
| | Clinic system | Opening diabetes clinic many days per week |
| | | Lack of standard protocol for screening test/ inactive screening programme |
| | | Too frequent changing of the physicians and nurses in PHCCs |
| | | To be managed in one place where all services are available, not to visit many clinics and hospitals |
| | | Healthcare staff is not always available in their clinics (moving around) |
| | | Absence of clinic system for regular patient follow up / improving the clinic system |
| | | Open the reception in ADC & AGH outpatient clinics for 24 hours a day |
| | | System for organizing the movement of patients inside the PHCC and when to enter the clinic |
| | | Lack of enough time to examine patients completely/ only doing investigations |
| | | More care , attention, concern and commitment from higher authorities |
| | | Health insurance system and financial support |
| | | Working two shifts (day & night) |
| | Appointment | Lack of appointment system for follow up |

| | | |
|---|---|---|
| | system | Inappropriate appointment system and times |
| | | Long appointment waiting list |
| | | Overcrowding |
| | | Long waiting time in front of the clinic while patients are fasting |
| | | Long appointment time with ophthalmology clinics |
| | | System for defaulter follow up |
| | | High defaulter rate |
| | | Appointment reminder using mobile (SMS) |
| | Referral and communication system | Not to refer patients to hospitals/ all investigations to be in the PHCCs |
| | | Delaying referral or not to refer patients at the right time (when needed) |
| | | Referring from one physician/clinic to another |
| | | Lack of proper communication/coordination between different healthcare levels |
| | | Lack of communication between hospitals |
| | | Lack of communication between PHCCs |
| | | Inappropriate annual referral system to hospitals (difficulties) |
| | | No feedback from hospitals for referrals |
| | | Lack of coordination between PHCCs and patient employers regarding attending clinic appointments |
| | | Lack of good reception in ADC |
| | | Lack of reception in AGH outpatient clinics |
| | Staff attitudes and skills | Untrained healthcare staff |
| | | Careless healthcare staff |
| | | Coming late at morning |
| | | Lack of good communication with patients |
| | | Language barriers/ foreign doctors |
| | | Lack of proper training |
| | | Lack of motivation/ incentives |
| Health education and promotion | Health education | Health education materials, systems, programs and clinics |
| | | Educating physician on diabetes management |
| | | Diabetes cards |
| | | Explaining test results to patients |
| | | To train patients on how to use the glucometer |
| | | To train patients on how to take insulin |
| | | Diet and nutrition education |
| | | Health promotion and education campaigns outside the PHCCs |
| | Health promotion programs | Effective diet and nutrition programs/ programmes for control of dyslipidemia |
| | | Exercise programs |
| | | Reducing weight programs |

| | | |
|---|---|---|
| | | Lifestyle management programs |
| Health records | Electronic health records | Lack of electronic health records |
| | Maintenance | Lack of good maintenance of health records |
| | | Incomplete/un-updated records |
| Patient related issues | Patient's knowledge and behaviours | Lack of or limited health awareness |
| | | Poor compliance for diet, drug, appointment, and exercise |
| | | Patients do not like to wait |
| | | Patients refuse to be annually referred to hospitals |
| | | Patients refuse to visit the clinic but ask to collect prescription and drugs |
| | | Lack of knowledge |
| | | Passive and dependent patients |
| | | Patients do not trust physicians |
| | | Patients request collecting drugs without prescription or diabetes card |
| | | Patients request drugs for a longer period |
| | | Patient is registered in many PHCCs |
| | | Poor patient communications/ behaviour inside PHCCs |
| | Accessibility and transport | To change PHCC site, the PHCC is difficult to access/ far from home |
| | | Unable to visit the PHCC or hospitals |
| | | Mini-clinic for diabetes should be placed in the ground floor |
| | | Patients' employers do not give permission to patients to attend their appointment in the PHCC for follow up care |
| | | Transport facilities (difficulties) for some patients |
| | Home care | Home care and home visits, providing care to bedridden patients, delivery of drugs to homes |
| | Income | Limited or low income |
| General facilities | Exercising facilities | Sport clubs |
| | | Health clubs and gym |
| | | Swimming pools |
| | | A place for walking, boardwalks |
| | Meeting and gathering facilities | A space in the PHCCs to meet other diabetic patients |
| | | Clubs for diabetic patients |
| | Other facilities | Box for patient suggestions |
| | | Limited car parks around the PHCCs |

**List 19.2:** List of reported responses to the question "What are the most prevalent health problems? Which problems have most impact on health at the national level?"

| Theme | Responses |
|---|---|
| **Non-communicable** | Diabetes |
| | Hypertension |
| | Obesity |
| | Dyslipidemia |
| | Cerebrovascular accident (CVA) |
| | Bronchial asthma |
| | Ischemic heart disease (IHD), Myocardial infarction (MI) |
| | Sickle cell anaemia |
| | Depression |
| | Psychiatric diseases |
| | Musculoskeletal problems |
| | Gastrointestinal tract diseases (GIT diseases) |
| **Communicable** | Upper respiratory tract infection (URTI) |
| | Tuberculosis (TB) |
| | Bronchitis |
| **Behaviour and education** | Road traffic accidents (RTA) |
| | Inactivity or sedentary lifestyle |
| | Incorrect health behaviours |
| | Health awareness & education |
| | Smoking |

**List 19.3:** List of reported responses to the question "Please specify if there are any population groups with diabetes whose health needs are not being currently met? Please tell us who they are and why: e.g. an entire ethnic group?"

| Theme | Responses |
|---|---|
| Inside Abha city | Older people |
| | School age children |
| | Expatriates |
| | Patients with type 1 DM |
| | >70 y older people |
| | Disabled people |
| | Pregnant ladies |
| | Patients with co-morbidities |
| | Illiterate females |
| | Older people who live alone |
| | Poor people |
| | Adults (30 -39) careless patients |
| | Diabetics with tacit organ involvement |
| Outside Abha city | Tahama population |
| | The people of remote villages |

**List 19.4:** List of reported responses to the question "What are the barriers for high risk groups to participate and utilize the available preventive services?"

| Theme | Barriers |
|---|---|
| **Patient related** | Low/lack of health awareness/ knowledge |
| | Incorrect patient believes/ Social culture and believes |
| | They are afraid to know that they might have the disease |
| | Eating habits & social gatherings |
| | Lack of community participation |
| | Limited time/ busy life |
| | Failing to change personal behaviours |
| | Unawareness of the importance of prevention |
| | Unawareness of diabetes risk factors |
| **Service related** | Inadequate level of healthcare provision/ inappropriate healthcare services at PHCCs |
| | Ineffective screening programme at PHCCs |
| | Limited health education |
| | Difficult access to healthcare / Lack of transport particularly for ladies |
| | Lack of interventions to attract patients to participate/ Weak motivation campaigns |
| **No barriers** | There is no actual barriers |

**List 19.5:** List of reported responses to the question "What are the other primary healthcare services you think people with diabetes need to be available in each primary health care centre and currently are not available? E.g making appointment system, specific lab facilities, specific drugs, specific clinics..."

| Theme | Responses |
|---|---|
| **Laboratory resources** | Some Lab services in PHCC ( a lab with all investigations/services) |
| | ECG machine/ ECG |
| | X-ray department |
| | Hba1c tests |
| | Lab in Johan PHCC |
| | Lipid profile tests |
| | RFT/LFT |
| **Pharmacy resources** | Some drugs (all drugs to be available) |
| | Glucometer for patients/ with it strips & needles |
| | All Insulin types (Lantus, Mixtard) |
| | Insulin syringes |
| | Alcohol swab |
| | Statins |
| | Small insulin syringes for children |
| | Drugs for impotence |
| | Drugs with long time before expiry |
| **Manpower and clinics** | Diabetologists in PHCC |
| | Dieticians/ Dietician clinics/ obesity clinics |
| | Health educators |
| | Ophthalmologists/ ophthalmology clinic in PHCC |
| | Specialist doctors (family physicians & other specialties) |
| | Podiatrists/ Podiatrist clinic |
| | Dermatologist |
| | More working staff |
| | Nephrologists / nephrology clinic in PHCC |
| | Geriatrists/ geriatrics clinic |
| | Trained nurses |
| | Female doctors |
| | Lab technicians |
| | Insufficient trained physicians |
| | Social workers |
| | Endocrinologists |
| **Other resources** | Special dental clinic for diabetics |
| | Modern devices |
| | Fundoscopy |
| | Diabetes card for patients where they can visit any clinic |
| | More wide waiting area |
| | Insulin pump/ clinic for patients with insulin pump |
| | Room for urgent cases with all necessary resources |

| | |
|---|---|
| | Psychosocial support |
| | Governmental PHCC buildings |
| | Opening more than one diabetes centre in the city |
| **Laboratory system** | Annual investigation to be in PHCCs |
| | Late laboratory test results |
| | To do laboratory tests before the clinic appointment by a long time |
| **Pharmacy system** | Quick response from pharmacy, pharmacists should quickly respond to patients |
| **Clinic system** | Opening diabetes clinic many days per week |
| | System for organizing the movement of patients inside the PHCC and when to enter the clinic |
| **Appointment system** | Appointment (follow up) system |
| | Appointment reminder by calling & SMS |
| | System for defaulter follow up |
| | Electronic appointment system |
| | A mobile for PHCCs to contact patients and remind them |
| | Quick available appointment |
| **Referral system** | Communication system between PHCC & hospitals |
| | Effective referral system |
| **Staff attitude** | Physicians should reassure and support patients |
| | To clinically examine the patients completely |
| | To examine patient foot |
| **Health education** | Health education/ educator, materials/ place/ screens/programs/lectures |
| **Health promotion** | Weight reduction and diet programmes |
| | Exercise education programmes |
| | Health promotion programmes |
| | Early diagnosis/ screening services |
| | Risk scoring system for diabetes to identify those at risk |
| **Health records** | Good file maintenance |
| | Electronic health records |
| **Home care** | Home care |
| | A program to deliver drugs to patient's home |
| **Accessibility** | To make services more easy accessible |
| **Administration** | Improved administration system and monitoring |
| **Meeting facilities** | Patient meetings / to gather all diabetics to know each other |
| | Clubs for diabetics |

**List 19.6:** List of reported responses to the questions "What are the current primary healthcare services you think needs to be improved or changed? What are your suggestions to improve these services? E.g making appointment system, mini-clinics for diabetes, more clinics for dietician or podiatrists..."

| Theme | Services need to be improved | Suggested improvements |
|---|---|---|
| **Laboratory resources** | Laboratory and Lab investigations | All tests to be available, to support the laboratory with computer and printer, to provide HbA1c test all the time, to provide good lab maintenance, to employ more lab technicians, to provide all the essential investigations, to support the lab with more devices and technicians, to purchase modern devices, to process the test more faster |
| | A laboratory in ADC | To provide a laboratory with all investigations available in ADC |
| | HbA1c | To be available in the laboratory |
| | X-ray | Provision of the device and the specialist |
| | ECG device | Provision of the ECG device |
| **Pharmacy resources** | Pharmacy and drugs | All resources to be available, to provide all necessary drugs, provision of alcohol swab, insulin syringes, insulin pens, new drugs, not nearly to expire drugs, to respond quickly to patients, home delivery of drugs |
| | A pharmacy in ADC | To establish a separate pharmacy in the ADC |
| | Statins | To be available |
| | Limited drug list | To add more options |
| | Glucometer and its strips | provision of more glucometers for patients |
| **Manpower and clinics** | Dieticians/ dietician clinics | To increase number of dieticians, to provide nutrition programs |
| | Lab technician | To employ more lab technicians |
| | Podiatrists/ Clinics for podiatrist | To increase number of podiatrists |
| | Healthcare staff | To employ more staff, to provide more intensive training and education, to employ more specialists |
| | Female dieticians | To employ female dieticians |
| | Female doctors | To employ specialist female doctors |
| | Ophthalmologists/ Ophthalmology clinics in AGH | To open ophthalmology clinic in the PHCCs, to employ more ophthalmologists in AGH, to provide AGH with eye examination devices |
| | Physicians | To employ more specialist physicians in the PHCCs |
| | Male nurses | To increase the number of male nurses employed |
| | Diabetologists | To employ more diabetologists in PHCCs and ADC |
| | Physiotherapists | To employ physiotherapists for older people |
| | Psychiatrists | To employ psychiatrists in PHCCs |
| | Nurses | To be specialized in diabetes, to respond quickly to patients |

| | | |
|---|---|---|
| | Female dentist | To employ more female dentists |
| | Paediatric diabetologist | To employ more paediatric diabetologists in ADC |
| | Dentists and dental clinic | To employ more consultants and provide devices |
| | Mini-clinics for diabetes | To provide the clinic with nuero-examination tools, ECG, diabetologist, specialists, to open the diabetes clinic one day for male, one day for female and one day for children, to open the clinic for 5 days a week, to transfer the clinic to be always in the first floor, to be wider, to establish a system where first come first served, to provide waiting area for diabetics, to provide patients with a mobile clinic, to make sure that all resources were provided |
| **Other resources** | PHCCs buildings | More wide rooms, more facilities for disabled patients, all supply and resources to be available, to build a governmental building for the PHCC, to build a special department for diabetics, to provide a waiting area for diabetics in PHCC, to have wide room for diabetes clinic, to provide reception services for patients |
| | Insulin pump | To give patients insulin pump |
| | Training | Increase staff training |
| | Screening test | Increase public awareness about screening |
| | Fundoscopy | To provide PHCC with fundoscopy |
| | Reception for patients in ADC | To provide more care and good reception, to provide good communication with patients |
| **Health education** | Health education | To employ more educators, to open health education clinics, provision of leaflets, pamphlets, printer, TV, Videos, to assign a room for dieticians and educators, To provide more health education for the local community |
| **Referral and communication system** | Referral system | To provide an electronic referral system, to initiate a good system for referral and feedback, to establish a good coordination between PHCCs and hospitals, to change the annual referral to be every 6 months, to do all the annual investigations in the PHCCs |
| **Health records** | Health records | To change the paper records to be electronic records, to improve the forms to be the same for all PHCCs |
| **Appointment system** | Appointment system | (establishing system to prevent duplicate appointments)(establishing electronic system for appointment) (make appointment system) (Reminder system)(reminding system by SMS mobile)(to open more than 2 days per week) (less waiting time) |
| | Follow-up system | To be regular and tracing defaulters |
| | Defaulter follow-up system | Activation of defaulter follow-up system, Follow defaulter and call them |
| **Broad, non-** | Improving all PHC | Establishing standards and improving quality |

| | | |
|---|---|---|
| **specific suggestions** | services in ADC | |
| | Medical machines & devices | To be all available |
| | All services need to be improved | All services need to be improved |
| | New departments in the PHCCs | To open ophthalmology, ENT, Internal medicine departments in the PHCCs |
| | Clinics | Open more clinics |
| | More research | To conduct more research |
| **Home care** | Home care | (to open a department for home care) (to visit bedridden, to deliver drugs to home) |
| **Administrative issues** | Administration | The administration should be more efficient and effective |
| | Job (work) monitoring | Effective monitoring system |
| **Accessibility** | PHCC site | Change PHCC site |

**List 19.7:** List of reported responses to the question "What are the obstacles (barriers) and facilitators for the referral system?"

| Theme | Facilitators |
|---|---|
| **System and process related** | Electronic referral system |
| | Involving patients in the referral process by taking back and forth the referral and feedback sheets |
| | Proper cooperation and coordination between PHCCs and hospitals |
| | Using the fax to send feedback to PHCCs |
| | Making appointments through the OPD or ADC's administration |
| | Good auditing system |
| | Commitment of higher authorities |
| **Service related** | Improving primary healthcare services to cancel the annual referral through provision of all the investigations to the PHCC |
| | Establishing one big central laboratory for all PHCCs |
| | Establishing diabetes centre for each health sectors |
| | Establishing a big central laboratory in AGH |
| **Patient related** | Educating patients |
| | Close hospital and PHCCs to the patients |
| | Cooperation of patients |
| | Quicker management processes to save patient's time |
| **Staff related** | Trained healthcare professionals |
| | Employing enough staff |

| Theme | Obstacles |
|---|---|
| **System and process related** | There is no clear and obvious referral system |
| | No feedbacks returned/ uncompleted feedbacks |
| | Incomplete annual investigations (some investigations are not done) |
| | Lack of cooperation between PHCCs and AGH/poor coordination with hospitals |
| | Patient overcrowding in hospitals |
| | Long waiting list for eye examination in AGH/ only one ophthalmologist available in AGH or ADC |
| | Long waiting time to enter the clinic |
| | Lack of patient education |
| | No appointment with dieticians |
| | Long waiting list |
| **Patient related** | Coming without Appointment |
| | Lack of recognizing the importance of annual investigation by patients |
| | Some patients just take the investigation results and leave without waiting to see the physician/ careless patients |
| | Patients refuse to be referred |

| | |
|---|---|
| **Staff related** | Doctors do not change the doses of medications based on the annual investigations or write recommendations |
| | Patients go to AGH but discovered that physician is not available temporarily/cause frustration and refuse to be referred in the future. |
| | Only one physician available in AGH |
| | Overloaded PHC physicians |
| | Negative staff attitude |

**List 19.8:** List of reported responses to the question "From your perspective, what are the barriers and challenges to service improvements?"

| Theme | Barriers of improving healthcare services (responses) |
|---|---|
| **Organization of diabetes care** | Lack of financial support |
| | PHCCs are ignored by higher authorities MOH and managers/ Weak commitment of higher authorities/ Higher authorities do not respond to the PHCCs requests/ Lack of attention to PHCCs by higher authorities |
| | Slow system |
| | Routine work |
| | Bad current system/ Lack of efficient system |
| | Lack of financial incentives |
| | Lack of cooperation, communication between healthcare levels |
| | Lack of support |
| | Lack of protocols for diabetes management in the ADC |
| | Patient overcrowding |
| | Lack of system to communicate with the higher authorities |
| | Inappropriate annual referral system/ waiting list, lack of feedback, referral to hospitals |
| | Weak governmental inter-sectoral coordination |
| | Lack of rules and systems for diabetes care |
| | No leadership |
| | Lack of system for defaulter's follow up |
| | Lack of computer system |
| | The mass media ignores the problem of diabetes |
| | Inactive DM screening program |
| | Too frequent changing of the physicians in PHCCs |
| | Referral to hospital (Annual referral to be in the PHCCs) |
| | Lack of cooperation between governmental sectors |
| | To be managed in different sites (PHCCs, AGH, ACH...) |
| | Annual referral to be to diabetes centre instead of AGH |
| | Lack of specialized clinics |
| | Lack of good appointment system |
| | Lack of Special department for diabetes care |
| | Lack of meeting what patients need |
| **Administration and system** | Underdeveloped and old managers in charge who are unwilling to improve or change the current system |

| | |
|---|---|
| **barriers** | Careless administrators and managers/ administrative problems/ Lack of primary health care administration and communication system/ Poor management |
| | Bureaucracy |
| | The administration system is corrupted/ Administrative barriers (corruption) |
| | Lack of good maintenance of medical devices |
| | Lack of enough permissions for healthcare managers to improve and purchase |
| | Lack of monitoring & penalizing |
| | Working only one shift (it should be 2 shifts day & night) |
| **Staff availability** | Insufficient staff/ Shortage of trained healthcare staff (specialists)/ Difficulties of employing more staff |
| | Lack of diabetologists (clinics) |
| | Lack of dieticians |
| | Lack of female doctors |
| **Staff training and performance** | Patient's awareness / Low patient's health awareness |
| | Lack of training & specialization |
| | Low staff awareness of what patients need |
| | Doctor's attitude, commitment |
| | No team work |
| | Lack of good communication with patients |
| | Careless officials |
| | Lack of working according to the system |
| | Lack of trained nurses |
| | Lack of patient motivation & incentives/ attention to the patients |
| | Lack of cooperation between PHCC staff |
| **Patient attitudes and behaviours** | Poor patient compliance |
| | Eating habits |
| **Patient knowledge and awareness** | Incorrect patient's believes |
| | Illiteracy |
| **Unavailable services** | Lack of diabetes centres |
| | Lack of good health education/ lectures, campaigns |
| | Lack of appointment system & reminder |
| | Lack of some medical devices |
| | Lack of psychosocial support for DM patients |
| | Lack of home care |
| | Nutrition programs for patients |
| | Lack of a lab in ADC |
| | Lack of research centre for diabetes |
| **Inadequate services** | inadequate lab investigations and devices/ resources/ Insufficient lab services (lab support) |
| | Limited resources in PHCCs / Shortage of supportive services/ Lack of enough resources |
| | Lack of governmental building/ good building |

| | |
|---|---|
| | Incomplete pharmacy resources/ lack of some drugs |
| | Low quality & cheap drugs |
| | Old rented PHCC buildings |
| | Lack of a place for walking |
| | Old medical devices |

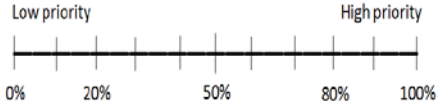
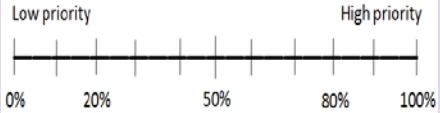
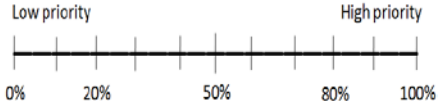
**List 19.9:** List of reported responses to the question "Is there a continuous auditing system for the healthcare services you provide? If yes: How are the services you and your colleagues provide audited? If no, do you think the health services should be audited?"

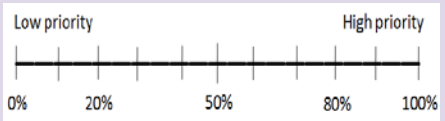
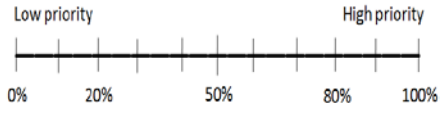
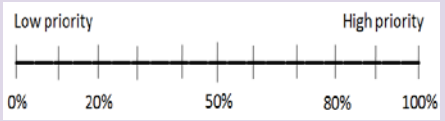
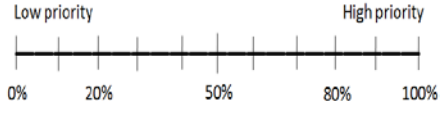
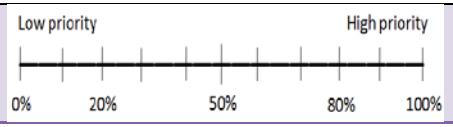
| Theme | How are the services audited? |
|---|---|
| **By regular discussion** | Meeting every Saturday and Tuesday to discuss any problem in the ADC |
| **By reviewing statistical reports** | By reviewing monthly and annually statistical reports |
| | Through studying the annual statistical reports of AGH and take decision based on that |
| | By using the annual report and then put an annual plan for the PHCCs |
| | Every 3 months using a personal efforts by reviewing the statistical reports |
| | By using the monthly and annual reports and feedbacks from different healthcare levels |
| | By reviewing the annual reports |
| **By higher authorities** | By coordination with the higher health sectors through reviewing the statistics |
| | It is the responsibility of healthcare sectors |
| | By regular supervision of higher authorities |
| | By sending all annual and monthly reports to MOH and it is the responsibility of higher authorities |
| **By other methods** | There is no guideline for how to audit PHCC's healthcare services, so solutions are just personal efforts of inexperienced staff |
| | By using standard checklist |
| | Routine feedback from PHCCs |
| | Assessment the readings of FBG and changing the management plan according to these readings |
| | By a questionnaire to be filled by patients |

## Appendix 20: Priority questionnaire for healthcare leaders

### Priority questionnaire for healthcare leaders

Could you please read carefully the following summary of the findings of a research which was conducted in Abha city and the recommendations suggested. Then please rate the priority of implementing each recommendation on a scale of 0 to 100%, where 100% being the highest priority.

| Where we are (findings) | Where we need to be | Priority rate | Why? |
|---|---|---|---|
| **National policies and strategies of diabetes care** | | | |
| • National health system, Office of the Presidency Council of Ministers, 1432<br>• Health care strategy in the Kingdom of Saudi Arabia, Office of the Presidency Council of Ministers 1430<br>• The detailed implementation plan for the Health care strategy in the Kingdom of Saudi Arabia, Office of the Presidency Council of Ministers 1432<br>• National system of healthcare professional practice, Office of the Presidency Council of Ministers 1426<br>• MOH strategic plan for 1431-1440, MOH, 1431 | 1. Need to audit diabetes services at the national and regional level. |  | |
| | 2. Need to conduct national survey for diabetes, last one was in 1995 |  | |
| | 3. Ensuring the active involvement of patients in service development. |  | |

| | | | |
|---|---|---|---|
| • Quality assurance in PHC manual (standards & indicators, MOH, 1994) | 4. Need to updated the quality assurance in PHC manual which should include a national strategy for diabetes control, standards for clinical care and service delivery for both urban and rural areas. |  | |
| | 5. National quality assurance manual for diabetes care at hospital & diabetes centres is needed. |  | |
| • Mini-clinic program for chronic diseases at PHC, MOH | 6. Mini-clinic program for chronic diseases at PHC need to be audited & evaluated to measure its implementation, effectiveness |  | |
| • The Gulf Executive Plan for Diabetes Control (2008-2018), GCC council of health ministers | 7. The Gulf Executive Plan for Diabetes Control (2008-2018) needs to be implemented, monitored & evaluated. |  | |
| • MOH Diabetes centres (tertiary centres) | 8. MOH Diabetes centre services need to be audited & evaluated. |  | |

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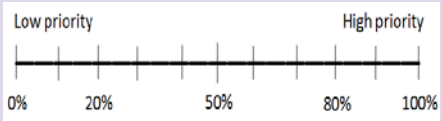
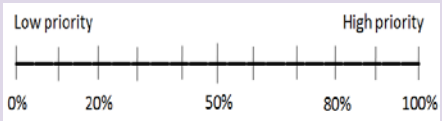
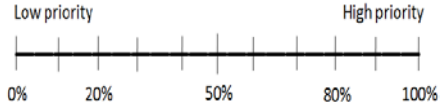
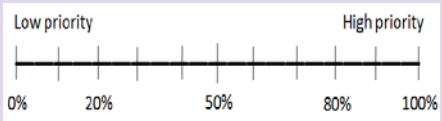
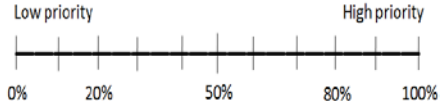
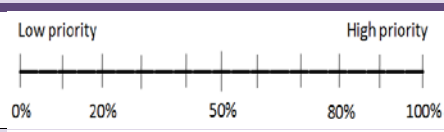
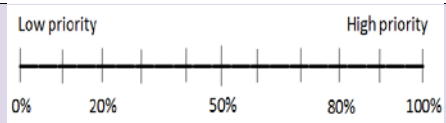
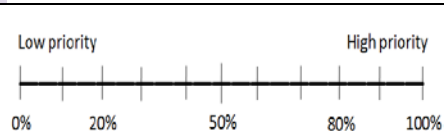
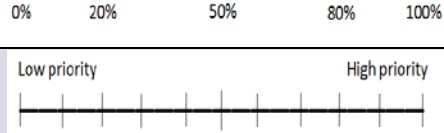
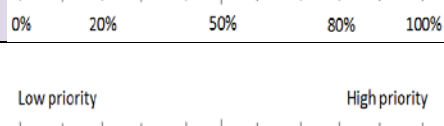
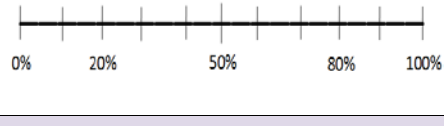
| **Clinical practice guidelines** | | | |
| • National clinical guideline for care of diabetic patients at primary health care, 2011 | 9. Ensure implementation of this guideline & consider its recommendations in any future planning. |  | |
| **Health care service computerization** | | | |
| • There is no national obesity management guideline<br>• There is no physical activity guideline | 10. Need to develop or adapt obesity & physical activity guidelines |  | |
| • There is no computer systems at PHCCs<br>• There is no electronic health records at PHCCs or hospitals<br>• There is no electronic database for diabetes at regional level<br>• There is diabetes register book at PHCCs as part of mini-clinic program and specific form for the national diabetes register at diabetes centre but there is no electronic registry system<br>• There is national diabetes registry which started in 2001 & by 2011 only 26 hospitals from Riyadh region were included as a source of data and still in phase I.<br>• Failed attempt to computerize PHCCs. | 11. Need to computerize all the health care system |  | |
| | 12. Need to complete the database of Saudi National Diabetes Registry to include all country regions & involve PHCCs as sources of data in addition to hospitals and diabetes centres. |  | |
| | 13. Need to computerize health records and systems to facilitate data availability for auditing, monitoring improvements & performance...etc |  | |

| Occurrence of diabetes | | | |
|---|---|---|---|
| • The national prevalence of diabetes in adults is one of the top ten highest in the world (13.6-25%)<br>• The prevalence of diabetes in Saudi Arabia has risen over the last 2 decades & is predicted to continue to rise in the next twenty years.<br>• The number of people with diabetes in Abha city has risen each year over the last 3 years & every month during the last year<br>• The local (Abha city) registered prevalence (3.75%) of clinically diagnosed diabetes is much lower than the national prevalence (14.1%)<br>• Almost three quarters (73.4%) of people with diabetes in Abha city have not been diagnosed<br>• There is local variation in prevalence of undiagnosed diabetes between PHCCs in Abha city.<br>• Lack of robust data on diabetes at the national, regional & local levels<br>• Lack of local data on incidence of diabetes | 14. Effective public health interventions are needed to reduce the burden of diabetes. |  | |
| | 15. High quality of diabetes care is needed to reduce the burden of diabetes complications. |  | |
| | 16. The gap between estimated prevalence & actual (registered) prevalence of diabetes need to be closed. |  | |
| | 17. Need to investigate why this gap exists & how to close it? |  | |
| | 18. Need to target catchment area of some PHCCs such as Almansak & Almowadafeen with high percentage of undiagnosed diabetes. |  | |
| | 19. Activating & enhancing the mini-clinic screening program is needed to identify undiagnosed diabetes. |  | |

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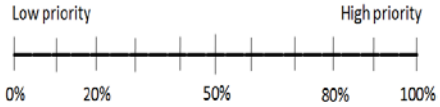
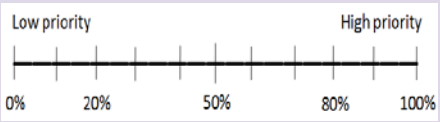
| in different age, sex, type of diabetes groups. | 20. Enhancing & supporting the new health promotion initiative & merging the mini-clinic screening program within its activity should be considered. |  | |
| | 21. Robust data on diabetes need to be available at the national, regional & local levels |  | |

| **Demographic issues** | | | |
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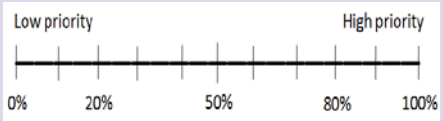
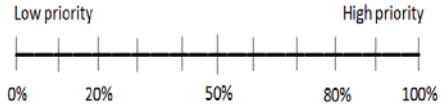
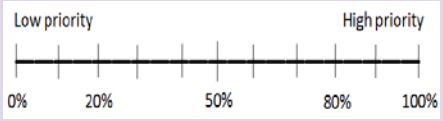
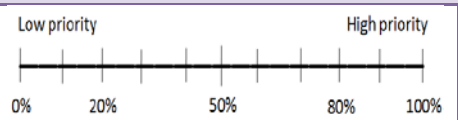
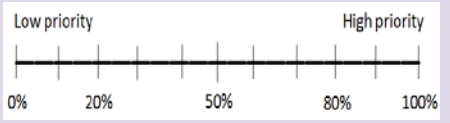
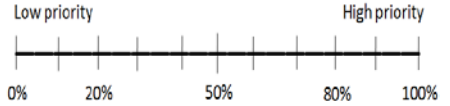
| • There is currently lack of local (Abha city) data on the breakdown of the local population in terms of:<br>o 5-years age groups<br>o Ethnicity<br>o Nationality<br>o Literacy<br>o Deprivation<br>• The total national population number is predicted to continue to rise with 16% increase between 2010-2020<br>• 85% of Abha's population is young <45 years which is similar to the whole Saudi population<br>• At the national level, it is projected that the proportion of population who are over 45 years old will rise from 15% in 2011 to 19% in 2020 and to 37.5% in 2050<br>• % of illiterate in females is more than double of males at the national & regional level<br>• 38.5% of diabetic patients in Abha city are illiterate | 22. Improving & increasing the available healthcare services are needed & should consider the predicted rise in the total population number and diabetic number particularly if there were no interventions to reduce the prevalence of diabetes. |  | |
| | 23. The predicted changes in the demographic characteristics such as increase the proportion of middle aged and older people should also be considered. |  | |
| | 24. Need to consider that a high proportion of diabetics are illiterate during planning for any interventions in Abha city. |  | |

| Diabetes risk factors | | | |
|---|---|---|---|
| ***Obesity*** | | | |
| • Obesity prevalence is the third highest rate in the world and is increasing with time at the national level.<br>• Obesity prevalence at regional level (Aseer region, 29.9%) is lower than the national prevalence, 35.5% among adults aged 30-70 years.<br>• Obesity estimated prevalence at the national level in children Aged 5-18 years is 9.3%.<br>• Obesity prevalence among diabetics in:<br>o Abha city is 44.8%<br>o Aseer region is 23.7%<br>o National level is 30%<br>• There is lack of data on obesity or overweight among Abha population. | 25. Effective national & local action to tackle obesity is urgently needed. |  | |
| | 26. Local data on obesity prevalence should be collected and published for research and auditing purposes. |  | |
| | 27. There is a need to promote physical activity & diet control |  | |

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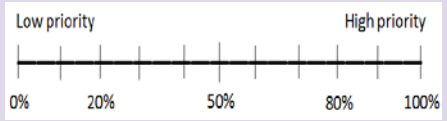
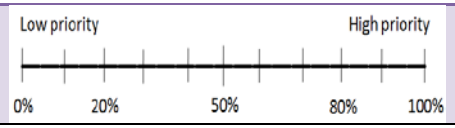
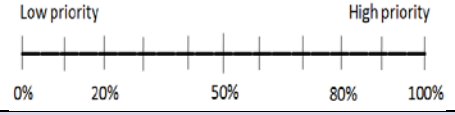
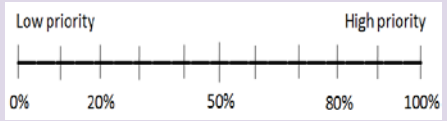
| ***Pre-diabetes*** | | | |
| • Pre-diabetes prevalence at:<br>a. National level is 11.8% among 20-79 years old<br>b. Regional level is 13.5% among 30-70 years old<br>c. Local level (Abha city), lack of data<br>• People with pre-diabetes are up to 15 times more likely to develop type 2 diabetes<br>• Intensive lifestyle interventions and/or therapeutic interventions can delay or prevent onset of type 2 diabetes | 28. Local data on pre-diabetes prevalence need to be collected and be available for researchers. |  | |
| ***Gestational diabetes*** | | | |
| • Lack of data on gestational diabetes at the national, regional or local level | 29. Data on gestational diabetes need to be collected and be available for researchers. |  | |
| | 30. There is a need to monitor the incidence of gestational diabetes |  | |
| | 31. There is a need for a local audit of care for gestational diabetes at the level of antenatal care at PHCCs and at maternity hospital (AGH) |  | |

| Population health status | | | |
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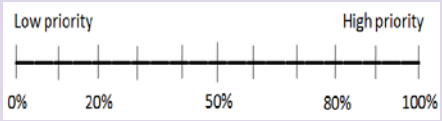
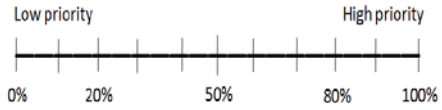
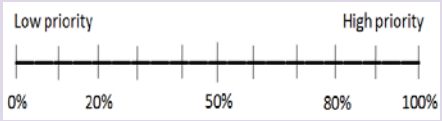
| • There is national data on :<br>o Mortality status<br>o Morbidity status<br>o Fertility status<br>o Employment status<br>• There is comparative national and regional data on:<br>o Education status<br>o Housing condition<br>o Water & electricity resources<br>• However, there is lack of local (Abha city) data on all of the above items | 32. Central department of statistics & information should publish the census data for each city and this data should be available for researchers. |  | |
| • 15,399 deaths are estimated to be attributable to diabetes among adults (20-79 years) at the national level<br>• There is no local data on causes of deaths<br>• There is lack of local data on number of deaths attributable to diabetes | 33. Certificate of death need to be improved to include in details the causes of death |  | |
| | 34. Adequate computer system at hospitals is needed to collect reliable data on diabetes emergency visits, admissions, length of hospital stay. |  | |

| Healthcare utilization | | | |
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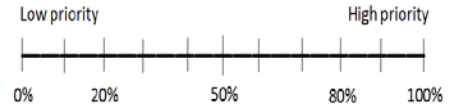
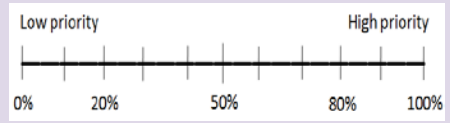
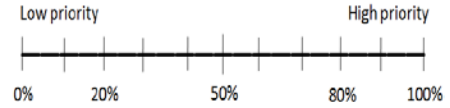
| ***Diabetes related follow-up visits at primary healthcare*** | | | |
| • Number of diabetes related follow-up visits are recorded at all primary healthcare centres in Abha city except Almansak PHCC. | 35. Almansak PHCC must record routinely the number of diabetes related follow-up visits. |  | |
| • The mean proportion of diabetes visits to PHCCs each month (No. of diabetes visits/total No. of registered diabetics) is 33% and ranges from 20.8% at AlKaabel PHCC to 54.8% at Therah PHCC. | 36. The following PHCCs should increase the mean proportion of diabetes visits each month:<br>a. Wasat Abha (24%)<br>b. Sultan city (21.6%)<br>c. Johaan (27%)<br>d. AlKaabel (21%) |  | |
| • From reviewing mini-clinic case notes, 1954 [44%] have not visited their PHCCs for the last 6 months which would indicate that some patients are using their general file not mini-clinic file to visit the doctor and collect diabetes drugs | 37. General PHCC clinics should not accept visits of diabetic patients outside the appointments of diabetes mini-clinic unless it is necessary and the prescription of anti-diabetes drugs should be only prescribed for a short period till the nearest appointment with the mini-clinic. |  | |

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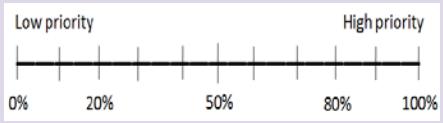
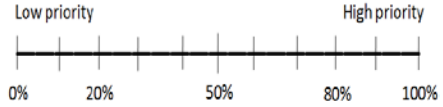
| • The total number of diabetes visits last year to<br>o PHCCs is 18463 visits<br>o AGH is 2819 visits<br>o ACH is 1609 visits<br>o ADC is 6852 visits | 38. The largest number of diabetes visits is to PHCCs which reflect that there is a need to increase the resources of PHCCs. |  | |
| • Each patient should visit the PHCC at least one time every 3 months, so the mean proportion of diabetes visits each month should not be less than 33%<br>• Is there a significant variation among the mean proportion of diabetes visits to each PHCC each month? | | | |
| ***Diabetes related visits to ACH*** | | | |
| • There is no data on classification of visits by type of diabetes and occurrence of complications | 39. Need for further regional and local data on diabetes visits by type of diabetes and occurrence of complications |  | |

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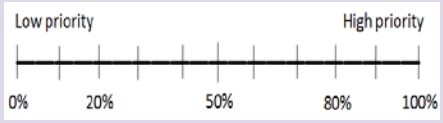
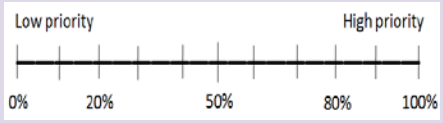
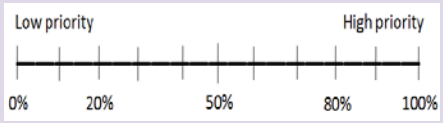
| ***Diabetes related visits to ADC*** | | | |
| • 75.5% of diabetic visitors are of type 2 diabetes and 90% are without any complications. This would indicate that the majority of patients does not need to be managed at ADC<br><br>• The quality assurance manual stated that those patients with type 2 diabetes who do not have any complication should be managed at their PHCCs. Only those with complication should be managed at hospitals. | 40. There is a need to revise the process of registering and following patients at ADC. |  | |
| ***Expenditure on diabetes services*** | | | |
| • There is no robust data on cost of diabetes at the national & local level<br>• The percentage of the national health expenditure on diabetes in 2010 is 21% (the second highest proportion in the world [IDF]) | 41. Robust data & studies are needed to estimate the total cost of diabetes at the national & local level |  | |
| ***Referral & feedback system*** | | | |
| • % of diabetics annual referral to Abha general hospital was **44%**<br>• % of hospital feedback for those who were referred was **71%** | 42. Need to increase the referral rate and hospital feedback to 100% |  | |

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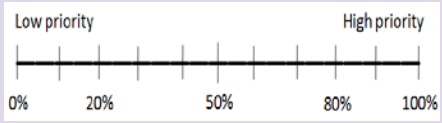
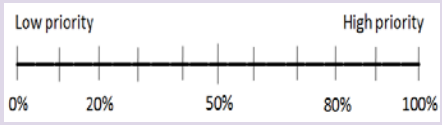
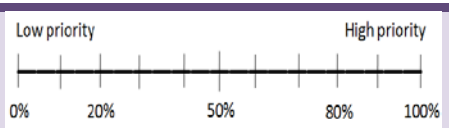
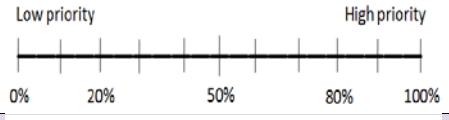
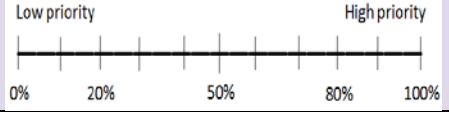
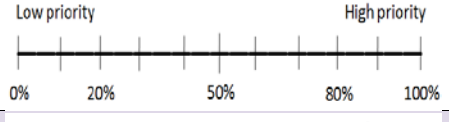
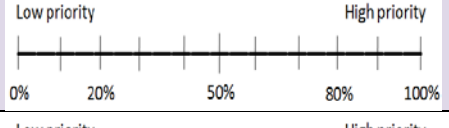
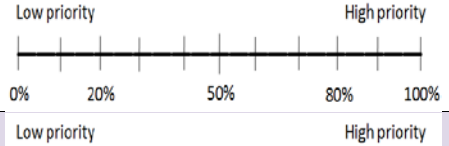
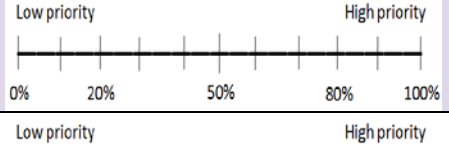
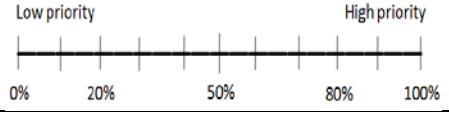
| ***Attendance at primary care*** | | | |
| • % of patients attended for 2 or more follow-up visits during the last 6 months of 2011/1432 was **38%**<br>• % of patients who have not attended for follow-up visits during the last 6 months of 2011/1432 was **44%** | 43. Patient's appointment compliance needs to be improved. |  | |
| ***Drug prescriptions*** | | | |
| • % of diabetic patients in each PHCCs receiving specific drugs varies significantly:<br>o ACE (0%-42.7%)<br>o Aspirin (9%-72%)<br>o Statins (0%-28%) | 44. Inequity in prescribing must be addressed by the Regional Health Affairs. |  | |

| Current diabetes service provision | | | |
|---|---|---|---|
| • 10 PHCCs & its Mini-clinics were evaluated and several needs were identified:<br>o Only 6 family medicine physicians are available<br>o 10 lab technicians are available<br>o There are only 3 x-ray technicians<br>o There are limited lab services (investigations) in PHCCs<br>o There is no lab at Johan PHCC<br>o There is no podiatrists, dieticians or health educators<br>o There is no home care or community health care services<br>• ADC was evaluated and several needs were identified:<br>o Only 1 paediatric endocrinologists available<br>o There is no podiatrist or podiatry services at ADC<br>o There is no health educators or social workers at ADC<br>• There is no tertiary care hospital in Abha city especially for eye care | 45. More Family medicine specialists are needed |  | |
| | 46. More lab technicians are needed especially for Johan and Almansak PHCCs (with equal distribution) |  | |
| | 47. More lab investigations were requested by patients, healthcare professionals |  | |
| | 48. More X-ray technicians are needed |  | |
| | 49. There is a need for a lab at Johan PHCC |  | |
| | 50. There is a need to employ podiatrists, dieticians &health educators in each PHCC |  | |
| | 51. There is a need for home care or community health care services |  | |
| | 52. There is a need for more diabetologists and endocrinologists at ADC |  | |

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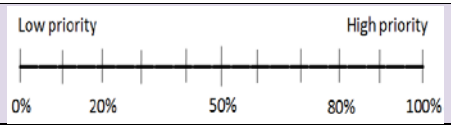
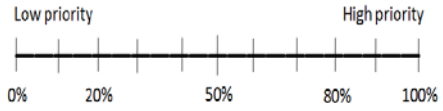
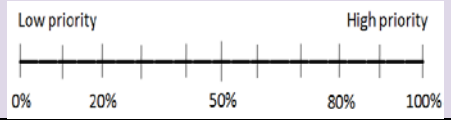
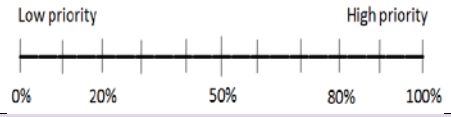
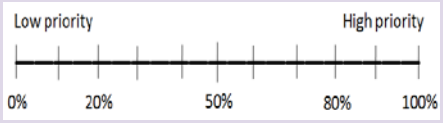
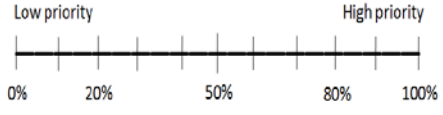
| | 53. There is a need to employ podiatrists, dieticians & health educators in ADC |  | |
| | 54. There is a need for tertiary care hospital in Abha city especially for eye care |  | |
| | 55. Patients, Healthcare professionals perceived they need more drugs to be available |  | |
| | 56. Patients, Healthcare professionals perceived they need more working staff |  | |
| | 57. Patients, Healthcare professionals, & managers perceived that diabetics need glucometer to be offered for free |  | |
| | 58. Children diabetes services at ADC need to be evaluated & monitored to ensure that key processes of diabetes care are provided. |  | |

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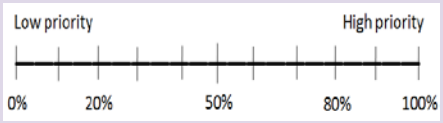
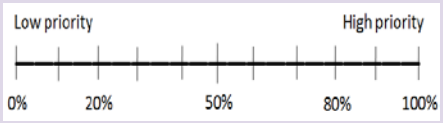
| **Mini clinic resource evaluation** | | | |
| • Mini-clinic resources are not complete for any PHCC | 59. Mini-clinic resources need to be available all the time particularly for Alaziziah, Therah, Wasat Abha and Johan PHCCs |  | |
| **Health Education** | | | |
| • PHCC,s Health education program was evaluated and it was partially implemented, From reviewing the best most completed education checklist sheet of 4458 case notes, only 18.2% were completed, 74.4% were partly completed & 6% of the case note were not including education checklist sheet. | 60. Health education program need to be implemented efficiently and effectively. |  | |

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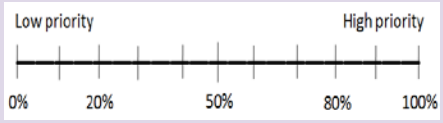
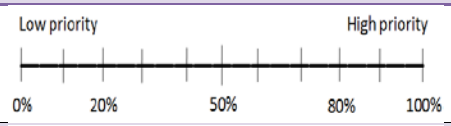
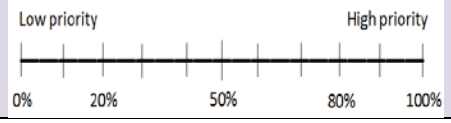
| **Preventive services** | | | |
| • PHC screening for diabetes & health promotion programs are available based on MOH & ADA guidelines<br>• Diabetes complications were unrecognised because of lack of examining patients to detect these complications:<br>a. Hypertension : 22% of diabetics<br>b. Ischemic heart disease: 3%<br>c. Cerebrovascular disease : 1.4%<br>d. Peripheral arterial disease : 0.4% | 61. These screening programs need to be enhanced & implemented effectively and evaluated for its effectiveness. |  | |
| | 62. Annual examination needs to be implemented effectively & completely. |  | |
| | 63. Retinopathy screening program for all diabetics is needed |  | |

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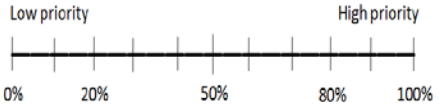
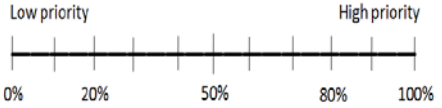
| e. Retinopathy (Eye diseases) : 10.5%<br>f. Nephropathy (Kidney diseases) : 1.8%<br>g. Neuropathy (Nerve damage) : 0.7%<br>h. Foot problems (amputations) : 1%<br>• Annual examinations from the most recent hospital feedbacks:<br>a. BP examination: 51% of diabetics<br>b. Cardiovascular : 42%<br>c. ECG: 74%<br>d. Chest x ray: 3%<br>e. Eye examination: 52%<br>f. Creatinine: 75%<br>g. Neuro-examination: 37%<br>h. Foot examination: 6%<br>i. 24 hours urine proteins: 2.5% | 64. Foot screening for those diabetics at high risk is needed |  | |
| ***Blood glucose control*** | | | |
| • % of patients with diabetes who have at least three record of FBG in the previous 12 months at PHCC is **31.4%**<br>• Mean FBS in the previous 12 months is **179.23** mg/dl<br>• % of patients with diabetes in whom the mean FBG is 130 mg/dl or less in the previous 12 months was **23%**<br>• % of patients with diabetes in whom the mean FBG is more than 130 mg/dl in the previous 12 months was **77%** | 65. Effective interventions to improve monitoring of blood glucose and its control is needed |  | |

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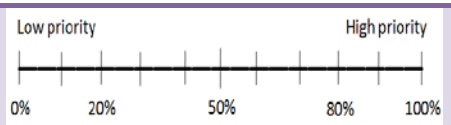
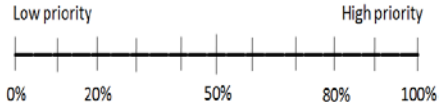
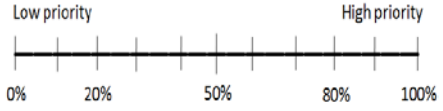
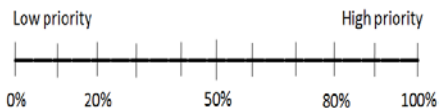
| ***HbA1c control*** | | | |
| • % of patients with diabetes who have a record of HbA1C so far was **3.61% with mean HbA1C of 11.41%**<br>• % of patients with diabetes in whom the last HbA1C is more than 7.5% was **82.6%** | 66. There is a need for provision of HbA1C machine at all PHCCs and ADC |  | |
| | 67. There is a need for HbA1C machine to be available at all the time |  | |
| ***Blood pressure control*** | | | |
| • % of patients with diabetes who have at least three record of BP in the previous 12 months was **38%** | 68. Need to increase number of diabetics with more than 3 records of BP in the previous 12 months |  | |
| ***Control of blood lipid*** | | | |
| • % of patients with diabetes who have a record of cholesterol by reviewing the most recent hospital feedback at any time was **77%** with a mean value of **195.3** mg/dl<br>• % of patients with diabetes in whom the most recent cholesterol is more than 156 mg/dl (4 mmol/l) was **81.26%**<br>• % of patients with diabetes in whom the most recent cholesterol is more than 195 mg/dl (5 mmol/l) was **47.29%** | 69. Need to reduce the high number of diabetic patients with cholesterol more than 156 mg/dl (4 mmol/l) |  | |

## Appendix 21: The mean priority score for each recommendation categorized by themes.

| Theme | Recommendations | Mean priority score |
|---|---|---|
| Prevention | Effective public health interventions are needed to reduce the burden of diabetes. | 95.94 |
| | Activating and enhancing the mini-clinic screening program is needed to identify undiagnosed diabetes. | 97.81 |
| | Enhancing and supporting the new health promotion initiative and merging the mini-clinic screening program within its activity should be considered. | 92.81 |
| | Effective national and local action to tackle obesity is urgently needed. | 94.69 |
| | There is a need to promote physical activity and diet control. | 97.19 |
| | Health education program need to be implemented efficiently and effectively. | 94.69 |
| | These screening programs need to be enhanced and implemented effectively and evaluated for its effectiveness. | 94.69 |
| | Annual examination needs to be implemented effectively and completely. | 96.56 |
| | Retinopathy screening program for all diabetics is needed. | 94.69 |
| | Foot screening for those diabetics at high risk is needed. | 95.31 |
| | Effective interventions to improve monitoring of blood glucose and its control is needed. | 95.94 |
| | Need to increase number of diabetics with more than 3 records of BP in the previous 12 months. | 90.94 |
| | Need to reduce the high number of diabetic patients with cholesterol more than 156 mg/dl (4 mmol/l). | 91.56 |
| Policies and strategies for diabetes care | Need to conduct national survey for diabetes, last one was in 1995. | 90.63 |
| | Ensuring the active involvement of patients in service development. | 88.13 |
| | Need to updated the quality assurance in PHC manual which should include a national strategy for diabetes control, standards for clinical care and service delivery for both urban & rural areas. | 91.88 |
| | National quality assurance manual for diabetes care at hospital and diabetes centres is needed. | 96.88 |
| | The Gulf Executive Plan for Diabetes Control (2008-2018) needs to be implemented, monitored and evaluated. | 80.63 |
| | Ensure implementation of this guideline and consider its recommendations in any future planning. | 91.88 |
| | Need to develop or adapt obesity and physical activity guidelines. | 90.94 |

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| **Healthcare processes and utilization** | High quality of diabetes care is needed to reduce the burden of diabetes complications. | 95.94 |
| | The gap between estimated prevalence and actual (registered) prevalence of diabetes need to be closed. | 94.69 |
| | Need to investigate why this gap exists and how to close it? | 84.06 |
| | Need to target catchment areas of some PHCCs such as Almansak and Almowadafeen with high percentage of undiagnosed diabetes. | 83.44 |
| | The following PHCCs (wasat Abha, Sultan city, Johan, and AlKaabel) should increase the mean proportion of diabetes visits each month. | 88.44 |
| | General PHCC clinics should not accept visits of diabetic patients outside the appointments of diabetes mini-clinic unless it is necessary and the prescription of anti-diabetes drugs should be only prescribed for a short period till the nearest appointment with the mini-clinic. | 91.25 |
| | There is a need to revise the process of registering and following patients at ADC. | 89.69 |
| | Need to increase the referral rate and hospital feedback to 100%. | 77.81 |
| | Patient's appointment compliance needs to be improved. | 90.94 |
| **Availability of data** | Need to complete the database of Saudi National Diabetes Registry to include all country regions and involve PHCCs as sources of data in addition to hospitals and diabetes centres. | 90.94 |
| | Robust data on diabetes need to be available at the national, regional and local levels. | 90.31 |
| | Local data on obesity prevalence should be collected and published for research and auditing purposes. | 90.94 |
| | Local data on pre-diabetes prevalence need to be collected and be available for researchers. | 87.81 |
| | Data on gestational diabetes need to be collected and be available for researchers. | 85.31 |
| | Central department of statistics and information should publish the census data for each city and this data should be available for researchers. | 87.19 |
| | Certificate of death need to be improved to include in details the causes of death. | 85.31 |
| | Almansak PHCC must record routinely the number of diabetes related follow-up visits. | 94.06 |
| | Need for further regional and local data on diabetes visits by type of diabetes and occurrence of complications. | 87.19 |
| | Robust data and studies are needed to estimate the total cost of diabetes at the national and local level. | 86.56 |

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| **Diabetes service provision** | Improving and increasing the available healthcare services are needed and should consider the predicted rise in the total population number and diabetic number particularly if there were no interventions to reduce the prevalence of diabetes. | 89.06 |
| | The predicted changes in the demographic characteristics such as increase the proportion of middle aged and older people should also be considered. | 85.94 |
| | Need to consider that a high proportion of diabetics are illiterate during planning for any interventions in Abha city. | 79.69 |
| | The largest number of diabetes visits is to PHCCs which reflect that there is a need to increase the resources of PHCCs | 91.25 |
| | Inequity in prescribing must be addressed by the Regional Health Affairs. | 84.69 |
| | More Family medicine specialists are needed. | 86.88 |
| | More lab technicians are needed especially for Johan and Almansak PHCCs (with equal distribution). | 90.31 |
| | More lab investigations were requested by patients, healthcare professionals. | 92.5 |
| | More X-ray technicians are needed. | 62.81 |
| | There is a need for a lab at Johan PHCC. | 82.19 |
| | There is a need to employ podiatrists, dieticians and health educators in each PHCC. | 89.38 |
| | There is a need for home care or community health care services. | 82.19 |
| | There is a need for more diabetologists and endocrinologists at ADC. | 84.06 |
| | There is a need to employ podiatrists, dieticians and health educators in ADC. | 90.94 |
| | There is a need for tertiary care hospital in Abha city especially for eye care. | 94.06 |
| | Patients, healthcare professionals perceived they need more drugs to be available. | 89.69 |
| | Patients, healthcare professionals perceived they need more working staff . | 87.81 |
| | Patients, healthcare professionals, and managers perceived that diabetics need glucometer to be offered for free. | 85.94 |
| | Mini-clinic resources need to be available all the time particularly for Alaziziah, Therah, Wasat Abha and Johan PHCCs. | 91.56 |
| | There is a need for provision of HbA1C machine at all PHCCs and ADC. | 93.44 |
| | There is a need for HbA1C machine to be available at all the time. | 90.31 |

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| **Service audit and evaluation** | Need to audit diabetes services at the national and regional level. | 93.75 |
| | Mini-clinic program for chronic diseases at PHC need to be audited and evaluated to measure its implementation, effectiveness. | 93.13 |
| | MOH Diabetes centre services need to be audited and evaluated. | 93.75 |
| | There is a need to monitor the incidence of gestational diabetes. | 90.31 |
| | There is a need for a local audit of care for gestational diabetes at the level of antenatal care at PHCCs and at maternity hospital (AGH). | 90.94 |
| | Children diabetes services at ADC need to be evaluated and monitored to ensure that key processes of diabetes care are provided. | 92.19 |
| **Healthcare service computerization** | Need to computerize all the health care system. | 86.56 |
| | Need to computerize health records and systems to facilitate data availability for auditing, monitoring improvements and performance...etc. | 88.44 |
| | Adequate computer system at hospitals is needed to collect reliable data on diabetes emergency visits, admissions, length of hospital stay. | 85.94 |

وصلى الله وسلم على سيدنا محمد وعلى آله وصحبه وسلم تسليماً كثيرا